CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Accredited with Grade A by NAAC
Accredited with Grade A by KCG

ACADEMIC REGULATIONS & SYLLABUS

Faculty of Technology & Engineering

Bachelor of Technology Programme
(Information Technology)

Education Campus – Changa, (ECC), hitherto a conglomerate of institutes of professional education in Engineering, Pharmacy, Computer Applications, Management, Applied Sciences, Physiotherapy and Nursing, is one of the choicest destinations by students. It has been transformed into **Charotar University of Science and Technology (CHARUSAT)** through an Act by Government of Gujarat. CHARUSAT is permitted to grant degrees under Section-22 of UGC- Govt. of India.

The journey of CHARUSAT started in the year 2000, with only 240 Students, 4 Programmes, one Institute and an investment of about Rs.3 Crores (INR 30 million). At present there are seven different institutes falling under ambit of six different faculties. The programmes offered by these faculties range from undergraduate (UG) to Ph.D. degrees. These faculties, in all offer 64 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Chandubhai S. Patel Institute of Technology	B. Tech M. Tech MTM Ph. D
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm M. Pharm MPM PGDCT/ PGDPT Ph. D
Faculty of Management Studies	IndukakaIpcowala Institute of Management	M.B.A PGDM Dual Degree BBA+MBA Ph.D
Faculty of Computer Applications	Smt. ChandabenMohanbhai Patel Institute of Computer Applications	M.C.A/MCAL M.Sc (IT) Dual Degree BCA+MCA Ph. D
Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc Dual Degree B.Sc+M.Sc Ph.D

Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy ManikakaTopawala Institute of Nursing Charotar Institute of Paramedical Sciences	B.PT M.PT Ph.D B.Sc (Nursing) M.Sc PGDHA PGDMLT GNM Ph.D

The development and growth of the institutes have already led to an investment of over Rs.125 Crores (INR 1250 Million). The future outlay is planned with an estimate of Rs.250 Crores (INR 2500 Million).

The University is characterized by state-of-the-art infrastructural facilities, innovative teaching methods and highly learned faculty members. The University Campus sprawls over 105 acres of land and is Wi-Fi enabled. It is also recognized as the Greenest Campus of Gujarat.

CHARUSAT is privileged to have 360 core faculty members, educated and trained in IITs, IIMs and leading Indian Universities, and with long exposure to industry. It is also proud of its past students who are employed in prestigious national and multinational corporations.

From one college to the level of a forward-looking University, **CHARUSAT** has the vision of entering the club of premier Universities initially in the country and then globally. **High Moral Values like Honesty, Integrity and Transparency** which has been the foundation of ECC continues to anchor the functioning of **CHARUSAT**. Banking on the world class infrastructure and highly qualified and competent faculty, the University is expected to be catapulted into top 20 Universities in the coming five years. In order to align with the global requirements, the University has collaborated with internationally reputed organizations like Pennsylvania State University – USA, University at Alabama at Birmingham – USA, Northwick Park Institute –UK, ISRO, BARC, etc.

CHARUSAT has designed curricula for all its programmes in line with the current international practices and emerging requirements. Industrial Visits, Study Tours, Expert Lectures and Interactive IT enabled Teaching Practice form an integral part of the unique **CHARUSAT** pedagogy.

The programmes are credit-based and have continuous evaluation as an important feature. The pedagogy is student-centered, augurs well for self-learning and motivation for enquiry and research, and contains innumerable unique features like:

- Participatory and interactive discussion-based classes.
- Sessions by visiting faculty members drawn from leading academic institutions and industry.
- Regular weekly seminars.
- Distinguished lecture series.
- Practical, field-based projects and assignments.
- Summer training in leading organizations under faculty supervision in relevant programmes.
- Industrial tours and visits.
- Extensive use of technology for learning.
- Final Placement through campus interviews.

Exploration in the field of knowledge through research and development and comprehensive industrial linkages will be a hallmark of the University, which will mould the students for global assignments through technology-based knowledge and critical skills.

The evaluation of the student is based on grading system. A student has to pursue his/her programme with diligence for scoring a good Cumulative Grade Point Average (CGPA) and for succeeding in the chosen profession and life.

CHARUSAT welcomes you for a Bright Future

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CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (Information Technology) Programme

Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
Phone: 02697-247500, Fax: 02697-247100, Email: info@charusat.ac.in
www.charusat.ac.in

Year – 2019-2020

CHARUSAT

FACULTY OF TECHNOLOGY AND ENGINEERING
ACADEMIC REGULATIONS
Bachelor of Technology Programmes

To ensure uniform system of education, duration of undergraduate and post graduate programmes, eligibility criteria for and mode of admission, credit load requirement and its distribution between course and system of examination and other related aspects, following academic rules and regulations are recommended.

1. System of Education

The Semester system of education should be followed across The Charotar University of Science and Technology (CHARUSAT) both at Undergraduate and Master's levels. Each semester will be at least 90 working day duration. Every enrolled student will be required to take a specified load of course work in the chosen subject of specialization and also complete a project/dissertation if any.

2. Duration of Programme

Undergraduate programme (B. Tech.)

Minimum	8 semesters (4 academic years)
Maximum	12 semesters (6 academic years)

3. Eligibility for admissions

As enacted by Govt. of Gujarat from time to time.

4. Mode of admissions

As enacted by Govt. of Gujarat from time to time.

5. Programme structure and Credits

As per annexure – I attached

6. Attendance

All activities prescribed under these regulations and enlisted by the course faculty members in their respective course outlines are compulsory for all students pursuing the courses. No exemption will be given to any student regarding attendance except on account of serious personal illness or accident or family calamity that may genuinely prevent a student from attending a particular session or a few sessions. However, such unexpected absence from classes and other activities will be required to be condoned by the Principal.

Student's attendance in a course should be 80%.

7 Course Evaluation

7.1 The performance of every student in each course will be evaluated as follows:

7.1.1. Internal evaluation by the course faculty member(s) based on continuous assessment, for 30% of the marks for the course; and

7.1.2 Final examination by the University through modes such as; written paper or practical test or oral test or presentation by the student or a combination of any two or more of these, is set to 70% of the marks for each the course.

7.2 Internal Evaluation

As per Annexure – I attached

7.3 University Examination

The final examination by the University for 70% of the evaluation for the course will be through written paper or practical test or oral test or presentation by the student or a combination of any two or more of these.

7.4 In order to earn the credit in a course a student has to obtain grade other than FF.

7.5 Performance at Internal & University Examination

7.5.1 Minimum performance with respect to internal marks as well as university examination will be an important consideration for passing a course.

Details of minimum percentage of marks to be obtained in the examinations (internal/external) are as follows

Minimum marks in University Exam per course	Minimum marks Overall per course
40%	45%

7.5.2 A student failing to score 40% in the final examination will get an FF grade.

7.5.3 If a candidate obtains minimum required marks in each course but fails to obtain minimum required overall marks, he/she has to repeat the university examination till the minimum required overall marks are obtained.

8 Grading

8.1 The total of the internal evaluation marks and final University examination marks in each course will be converted to a letter grade on a ten-point scale as per the following scheme:

Table: Grading Scheme (UG)

Range of Marks (%)	≥80	‹80 ≥73	‹73 ≥66	‹66 ≥60	‹60 ≥55	‹55 ≥50	‹50 ≥45	‹45
Corresponding Letter Grade	AA	AB	BB	BC	CC	CD	DD	FF
Numerical point (Grade Point) corresponding to the letter grade	10	9	8	7	6	5	4	0

8.2 The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his/her performance at the end of two or more consecutive semesters will be denoted by the Cumulative Grade Point Average (CGPA). The SGPA and CGPA are calculated as follows:

(i) SGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses in the semester

(ii) CGPA = $\Sigma C_i G_i / \Sigma C_i$ where C_i is the number of credits of course i
G_i is the Grade Point for the course i
and i = 1 to n, n = number of courses of all semesters up to which CGPA is computed.

(iii) No student will be allowed to move further in next semester if CGPA is less than 3 at the end of an academic year.

(iv) A student will not be allowed to move to third year if he/she has not cleared all the courses of first year.

(v) A student will not be allowed to move to fourth year if he/she has not cleared all the courses of second year.

9. Award of Degree

9.1 Every student of the programme who fulfils the following criteria will be eligible for the award of the degree:

9.1.1 He/She should have earned minimum required credits as prescribed in course structure; and

9.1.2 He/She should have cleared all internal and external evaluation components in every course; and

9.1.3 He/She should have secured a minimum CGPA of 4.5 at the end of the programme;

9.2 The student who fails to satisfy minimum requirement of CGPA at the end of program will be allowed to improve the grades so as to secure a minimum CGPA for award of degree. Only latest grade will be considered.

10 *Award of Class:*

The class awarded to a student in the programme is decided by the final CGPA as per the following scheme:

Distinction:	CGPA ≥ 7.5
First class:	CGPA ≥ 6.0
Second Class:	CGPA ≥ 5.0

11 *Transcript:*

The transcript issued to the student at the time of leaving the University will contain a consolidated record of all the courses taken, credits earned, grades obtained, SGPA,CGPA, class obtained, etc.

The Programme Educational Objectives (PEOs)

Program Objective 1

To provide students with Core Competence in mathematical, scientific and basic engineering fundamentals necessary to formulate, analyze and solve hardware/software engineering problems and/or also to pursue advanced study and research.

Program Objective 2

To train students with good breadth of knowledge in core areas of Information Technology and related engineering so as to comprehend engineering trade-offs, analyze, design, and synthesize data and technical concepts to create novel products and solutions for the real life problems.

Program Objective 3

To inculcate in students to maintain high professionalism and ethical standards, effective oral and written communication skills, to work as part of teams on multidisciplinary projects and diverse professional environments, and relate engineering issues to the society, global economy and to emerging technologies.

Program Objective 4

To provide our graduates with learning environment awareness of the life-long learning needed for a successful professional career and to introduce them to ethical codes and guidelines, leadership and demonstrate good citizenship.

The Course Outcome (COs)

1. An ability to apply knowledge of mathematics, probability & statistics, computer science, and engineering as it applies to the fields of computer software and hardware.

2. An ability to design and construct a hardware and software system, component, or process to meet desired needs, within realistic constraints such as economic, environmental, social, political, ethical, health & safety, manufacturability, and sustainability.

3. Graduates will be able to demonstrate the team work with an ability to design, develop, test and debug the project by developing professional interaction with each other that can lead to successful completion of project.

4. Graduates will possess leadership and managerial skills with best professional ethical practices and social concern.

5. Analyzing the requirement from the client, participating in preparing test plans,

preparing test scenarios, preparing test cases for module, analyzing test cases, executing test cases, defect tracking.

The Programme Outcomes (Pos)

1. The graduates will become familiar with fundamentals of various science and technology subjects and thus acquire the capability to applying them.
2. The graduates will be able to apply engineering knowledge and skills to problem and challenges in the area of information technology and to use system or to implement system, information technologies and modern engineering tools for designing, developing high quality technology based solutions.
3. Students will be able to effectively design various engineering components and make process plan to successful completion of project.
4. The graduates will demonstrate effective English language communication skills.
5. The graduates will develop capacity to understand professional and ethical responsibility and will display skills required for continuous and lifelong learning and up gradation.
6. Students will be able to analyze the local and global impact of computing on individuals, organizations, and society.
7. The graduates will recognize the need for an ability to engage in continuing professional development.

Charotar University of Science & Technology
Chandubhai S Patel Institute of Technology
Department of Information Technology

Vision

To inculcate excellent education to enhance professional behavior, strong ethical values, innovative research capabilities and leadership abilities in the young minds so as to work with a commitment to the progress of the country.

Mission

To impart quality education in both the theoretical and applied foundations of IT and educate students to effectively apply this education to solve real-world problems thus strengthening their lifelong high-quality careers in global work environment of the 21st century.

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)											
	TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN IT											
Sem	Course Code	Course Title	Teaching Scheme					Credit	Examination Scheme				
			Contact Hours						Theory		Practical/Project		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
SY Sem-3	MA245	Discrete Mathematics	4	0	0	0	4	4	30	70	0	0	100
	IT241	Digital Electronics	4	2	0	0	6	5	30	70	25	25	150
	IT242	Java Programming	4	4	0	0	8	6	30	70	50	50	200
		University Elective- I	2	0	0	0	2	2	30	70	0	0	100
	IT243	Data Communication	4	2	0	0	6	5	30	70	25	25	150
	HS	HS122 A - Values and Ethics	2				2	2	30	70	0	0	100
	IT244	Software Group Project-I	0	0	0	4	4	2	0	0	50	50	100
		Assignment Practices/Student Counseling/Remedial Classes	0	6	0	0	4	0	0	0	0	0	0
			20	**14**	**0**	**4**	**36**	**26**	**180**	**420**	**150**	**150**	**900**
SY Sem-4	MA244	Statistical And Numerical Techniques	4	0	0	0	4	4	30	70	0	0	100
	IT245.01	Computer Organization & Microprocessor Interfacing	3	2	0	0	5	4	30	70	25	25	150
	IT246	Web Engineering	2	4	0	0	6	4	30	70	50	50	200
	IT247.01	Data Structures & Algorithms	3	2	0	0	5	4	30	70	25	25	150
	IT248.01	Database Management System	3	2	0	0	5	4	30	70	25	25	150
	IT249	Software Group Project	0	0	0	4	4	2	-	-	50	50	100
	HSXXX	HS Elective-III	0	2	0	0	2	2	-	-	30	70	100
	XXXXX	University Elective- II	0	2	0	0	2	2	100				100
		Assignment Practices/ Student Counseling/ Remedial Classes	0	6	0	0	4	0	0	0	0	0	0
			15	**16**	**0**	**4**	**29**	**26**	**280**	**420**	**175**	**175**	**1050**

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)												
	TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN IT												
Sem	Course Code	Course Title	Teaching Scheme						Examination Scheme				
				Contact Hours				Credit	Theory		Practical		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
TY Sem -5	IT341	Design & Analysis of Algorithms	4	2	0	0	6	5	30	70	25	25	150
	IT342	Advanced Web Technologies	2	2	0	0	4	3	30	70	25	25	150
	IT343	Operating System	4	2	0	0	6	5	30	70	25	25	150
	IT344	Computer Networks	4	2	0	0	6	5	30	70	25	25	150
	HS 124.01A	Professional Communication	0	2	0	0	2	2	0	0	30	70	100
		Elective-I	2	4	0	0	6	4	30	70	50	50	200
	IT345	Software Group Project-II	0	0	0	4	4	2	0	0	50	50	100
	IT346	Summer Internship-I	0	0	0	3	3	3	0	0	75	75	150
	Assignment practices/ Student Counseling/ Remedial Classes		0	4	0	0	2	0	0	0	0	0	0
			16	**18**	**0**	**7**	**39**	**29**	**150**	**350**	**305**	**345**	**1150**
TY Sem -6	IT347	Software Engineering	4	2	0	0	6	5	30	70	25	25	150
	IT348	Cryptography & Network Security	4	2	0	0	6	5	30	70	25	25	150
	IT349	Wireless Communication & Mobile Computing	4	4	0	0	8	6	30	70	50	50	200
		Elective-II	4	2	0	0	6	5	30	70	25	25	150
	IT350	Software Group Project-III	0	0	0	4	4	2	0	0	50	50	100
		HS Elective-IV	0	2	0	0	2	2	-	-	30	70	100
	Assignment Practices/Student Counseling/Remedial Classes		2	0	6	0	0	4	0	0	0	0	0
			16	**18**	**0**	**4**	**36**	**25**	**150**	**350**	**175**	**175**	**850**

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)

TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN IT

Sem	Course Code	Course Title	Teaching Scheme						Examination Scheme				
			Contact Hours					Credit	Theory		Practical		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
Final Year Sem-7	IT441	Data Science	3	2	0	0	5	4	30	70	25	25	150
	IT442	Advanced Computing	3	2	0	0	5	4	30	70	25	25	150
	IT443	Language Processors	4	2	0	0	6	5	30	70	25	25	150
	IT444	Internet of Things	3	2	0	0	5	4	30	70	25	25	150
		Elective III	3	2	0	0	5	4	30	70	25	25	150
	IT445	Software Group Project – IV	0	0	0	4	4	2	0	0	50	50	100
	IT446	Summer Internship-II	0	0	0	3	3	3	0	0	75	75	150
		Assignment Practices/Student Counseling/Remedial Classes	0	6	0	0	2	0	0	0	0	0	0
			16	16	0	7	35	26	150	350	250	250	1000
Final Year Sem-8	IT407	Software Project Major	0	36	0		36	20	0	0	250	350	600
			0	36	0		36	20	0	0	250	350	600

	CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (CHARUSAT)					
	LIST OF ELECTIVE SUBJECTS FOR B TECH PROGRAMME IN IT					
ELECTIVES	**Code**	**Elective - I**	**Code**	**Elective - II**	**Code**	**Elective - III**
	IT371	Advanced Java programming	IT375	Service Oriented Computing	IT471	Foundation of Modern Networking
	IT373	Embedded Systems	IT376	Image Processing	IT472	High Performance Computer Architecture
	IT374	Python Programming	IT377	Machine Learning & Applications	IT473	Artificial Intelligence

HS Elective - I
HS101.01 A - Painting
HS102.01 A - Photography
HS103.01 A - Sculpting
HS104.01 A - Pottery and Ceramic Arts
HS105.01 A - Media and Graphic Design
HS106.01 A - Art and Craft
HS107.01 A - Fashion Designing
HS108.01 A - Interior Designing
HS109.01 A – Dramatics
HS110.01 A - Contemporary Dance
HS132 A - Academic English

HS Elective - II
HS122 A - Values and Ethics
HS131 A - Philosophy

HS Elective - III
HS123.01 A - Critical Thinking and Logic
HS127.01 A - Communication Skills – II
HS133 A - Creativity, Problem Solving and Innovation

HS Elective - IV
HS125.01 A - Society, Governance and International Studies
HS130 A - Law & Justice
HS134 A - Contributor Personality Development

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 3)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES
DEPARTMENT OF MATHEMATICAL SCIENCES

MA245: DISCRETE MATHEMATICS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	0	0	4	4
Marks	100	0	-	100	

A. Objective of the Course:

This course is an important course to understand the courses viz. (i) Theory of Computation (ii) Artificial intelligence (iii) Data structure and algorithm (iv) Compiler constructions (v) Algorithm analysis and design (vi) Digital electronics etc. and related subjects of the higher semester of B. Tech. (IT/CE).

The objectives of the course are to:

- revise the elementary concepts of Set Theory
- Understand appropriate algorithms of Discrete Mathematics and Graph Theory as applicable to digital computers.
- understand the concepts of Group theory and Graph Theory

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Set Theory and Predicate calculus	08
2.	Relations, Lattices and Boolean algebra	14
3.	Abstract Algebra	10
4.	Graphs and Graph Algorithms	12
5.	Matrix Algebra- II	10
6.	Fundamentals of Finite State Machine and Recurrence	06

Total hours (Theory): 60

Total hours (Lab): 00

Total hours: 60

C. Detailed Syllabus:

1	**Set Theory and Predicate Calculus**	**08 hours**	**14%**
	1.1. Proposition, Types of Proposition, Tautology, Contradictions, Connectives, Types of connectives		
	1.2. Logical equivalence, Verification using truth table		
	1.3. Converse, Inverse and Contrapositive, Normal forms		
	1.4. Introduction to predicates and quantifiers		
	1.5. Predicate calculus using rules of inferences		
	1.6. Logic in proof, Methods of Proof,		
	1.7. Mathematical Inductions (First Principle)		
	1.8. Properties of set operations with Predicate logic.		
	1.9. Cardinality of sets, Cartesian product of sets		
2	**Relations, Lattice and Boolean Algebra**	**14 hours**	**22%**
	2.1. Relations on sets, Types of Relations in a set		
	2.2. Properties of Relations		
	2.3. Representations of Relations		
	2.4. Equivalence relation, Covering of a set, Partition of a set		
	2.5. Partially ordered relations, Partially ordered sets, Lattice, Sub lattices		
	2.6. Properties of lattice		
	2.7. Some Special Lattices		
	2.8. Finite Boolean Algebra, atoms, anti - Atoms,		
	2.9. Sub - Boolean algebra, Boolean Expression		
	2.10. Boolean Functions,		
	2.11. Canonical Forms, Karnaugh map representation, Quine Mckausky's Algorithm		
3	**Abstract Algebra**	**10 hours**	**16%**
	3.1. Groupoid, Semi group, Monoid, Group		
	3.2. Order of group, order of an element, Lagrange's theorem		
	3.3. Subgroup, Cyclic subgroup, Permutation Group		
	3.4. Introduction to Ring Theory		
	3.5. Sub ring, Ring Homomorphism,		
	3.6. Ideals		

4	**Graphs and Graph Algorithms**	**12 hours**	**20%**

4.1. Basic terminologies, Simple graph, Types of graphs
4.2. Degree of a vertex
4.3. Sub graphs, Spanning Sub-graphs, Isomorphic graphs
4.4. Path and connectivity
4.5. Eulerian and Hamiltonian graph
4.6. Matrix Representation of graph
4.7. Planar Graphs
4.8. Introduction to tree, Directed tree, Forest
4.9. Types of trees, Spanning Tree, Minimal Spanning Tree
4.10. Algorithm to find minimal spanning tree, Prim's, Krushkal's and Dijkstra's Algorithm

5	**Matrix Algebra -II**	**10 hours**	**16%**

5.1. Revision of Determinant and Matrix
5.2. Eigen values and Eigen vectors of Matrices
5.3. Eigen values and Eigen vectors of Special Matrices
5.4. Applications of Cayley - Hamilton Theorem

6	**Basics of Finite State Machine and Recurrence Relation**	**06 hours**	**12%**

6.1. Introduction to Strings, Languages,
6.2. Regular expression, Grammars
6.3. Introduction to Recurrence relation,
6.4. Generating function

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.

- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Two Quizzes (surprise tests) will be conducted which carries 5% component of the overall evaluation.

E. Student Learning Outcomes:

- At the end of the course the students will be able to frame the fundamental algorithms of Discrete Mathematics/Graph theory and their applications in computer engineering.

F. Recommended Study Material:

❖ **Reference Books:**

1. Rosen, Kenneth H., and Kamala Krithivasan. Discrete mathematics and its applications. Vol. 6. New York: McGraw-Hill, 1995.
2. Tremblay, Jean-Paul, and Rampurkar Manohar. Discrete mathematical structures with applications to computer science. New York: McGraw-Hill, 1975.
3. McAllister, D. F., and D. F. Stanat. Discrete Mathematics in Computer Science. 1977 Prentice-Hall, Inc
4. Deo, Narsingh. Graph theory with applications to engineering and computer science. Courier Dover Publications, 2016.
5. B. Kolman and R. C. Busby, Discrete Mathematical Structures for Computer Science, 2nd edition, Prentice-Hall, Englewood Cliffs, New Jersey (1987).
6. Malik, D. S., and Mridul K. Sen. Discrete mathematical structures: theory and applications. Course Technology, 2004.
7. Thomas H.. Cormen, Leiserson, C. E., Rivest, R. L., & Stein, C. Introduction to algorithms (Vol. 6). Cambridge: MIT press,2001
8. Anton, Howard. Elementary linear algebra. John Wiley & Sons, 2010.
9. Gallian, Joseph. Contemporary abstract algebra. Cengage Learning, 2016

❖ **Web Materials:**

1. http://mathworld.wolfram.com/
2. http://en.wikipedia.org/wiki/Math

IT241: DIGITAL ELECTRONICS

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	**0**	150	

A. Objective of the Course:

This course will introduce the students about fundamentals of digital electronics including number systems, Boolean algebra and logic gates, combinational logic, designing of combinational and sequential circuits. This course aims to make the students familiar with the fundamental concepts and understandings of the digital applications such as clocks, sign boards, crossing signals, railways, airports, television, monitoring devices, security systems etc.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Number Systems	05
2.	Boolean Algebra and Logic Gates	06
3.	Simplification of Boolean Functions	07
4.	Combinational Logic	08
5.	Combinational Logic With MSI AND LSI	10
6.	Sequential Logic	10
7.	Registers, Counters and the Memory Unit	10
8.	Introduction to Verilog	04

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1.	**Number Systems** Digital Computer and Digital Systems, Binary Number, Number Base, Conversion Octal And Hexadecimal Number, Complements, Binary Codes, Binary Storage And Register, Binary Logic, Integrated Circuit	**05Hrs**	**8%**
2.	**Boolean Algebra And Logic Gates** Basic Definition, Axiomatic Definition of Boolean Algebra, Minterm And Maxterms, Basic Theorem And Properties of Boolean Algebra, Logic Operations, IC Digital Logic Families, Propagation delay, Fan in, Fan out	**06Hrs**	**10%**
3.	**Simplification of Boolean Functions** Two-Three Variable K-Map, Four- Five Variable K-Map, Product of Sum Simplification, NAND or NOR Implementation, Don't Care Condition, Tabulation Method	**07Hrs**	**12%**
4.	**Combinational Logic** Introduction, Design Procedure, Hazards, Adder, Sub tractor, Code Conversion, Universal Gate, Exclusive OR & Equivalence Functions	**08Hrs**	**14%**
5.	**Combinational Logic With MSI And LSI** Introduction, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoder, Multiplexer, ROM, PLA, PAL	**10Hrs**	**17%**
6.	**Sequential Logic** Introduction, RS,JK,D,T Flip-Flops, Triggering of Flip-Flops, Flip-Flop Excitation Tables, Analysis of Clocked Sequential Circuits, State Reduction And Assignment Design Procedure, Design of Counters, Design With State Equations	**10Hrs**	**17%**
7.	**Registers, Counters And The Memory Unit** Introduction, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Timing Sequences, Memory Unit, Johnson Counter	**10Hrs**	**17%**
8.	**Introduction to Verilog** Overview of Digital Design with Verilog HDL, Basic operations, Design of Fundamental digital blocks using various modeling styles.	**04Hrs**	**5%**

D. Instructional Method and Pedagogy:

- In the very beginning, the course delivery pattern, prerequisites of the subject will be discussed.
- Multimedia and overhead Projectors, Chalk - Board and White - Board will be used for Class room and laboratory teaching.
- Chapter / unit wise practice assignments will be given and student-wise evaluation will be done to strengthen the subject knowledge.
- Quiz / Q-A session will be conducted by the concerned faculty / lab in-charge both for the theory and experiments. It carries a weightage of 5%.
- Audio Visual Presentations through electronic means and related software, and on-line demonstrations from the authentic web sites of the other premium institutes.
- Internal tests (*as per the directions from the head and dean*) will be conducted as a part of the regular curriculum.
- Seminars on advanced topics related to this subject will be key features.
- On-hand practices for the experiments will be given to each student.
- Student wise Viva-Voce will be conducted for each experiment to evaluate the student's depth of learning.
- Academic counselling will reduce the formal distance between / amongst the students and faculty every fortnight.
- Technical events will be organized to motivate and prepare the students for the real industry applications.
- Students will be provided the latest updates such as technical articles, e-resources, printed materials and projects from magazines and journals.
- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- **Laboratory Manual:**

  It contains the objective / aim, list of equipment, procedures and steps, sample observations, sample results, conclusion, future perspectives and figures for each experiment.
- **Lesson Plan:**

  Lecture wise and faculty wise syllabus delivery plan for theory is provided to the students well in advance in the beginning of the semester. This consists of details of

the faculty, course, no. of lectures, internal exam and assignment plans, names of the books, authors, publications etc...

- **Laboratory Plan**

  Laboratory wise and faculty wise syllabus delivery plan for lab is provided to the students well in advance in the beginning of the semester. This consists of details of the faculty, course, no. of experiments etc....

- **Hand Outs:**

  Printed and handwritten study materials consisting of lecture notes, assignments, questions, solutions of typical questions from GATE, UPSC and other competitive exams as well.

- **Assignments:**

  It has a weightage of about 5% in the practical exams as an integrated component. About five / seven questions at the end of each chapter is given to the students and they are asked to submit the solutions / answers in writing within a stipulated time duration. The assignments are displayed on the notice board through the head of the department. The concerned faculty member evaluates the assignments, the results are submitted to the head of the department and the students are informed.

- **Question Bank:**

  At the end of the chapter, the concerned faculty(ies) discuss the questions asked in previous year exams. Also the hints, solutions and other variations of the questions are discussed in the class, in the faculty staff rooms and even through the e-mail facility. List of questions shorted out from the respective subject is circulated to the students at the end of the teaching term

E. Student Learning Outcome:

- Students will be able to design combinational circuits on bread board
- The development and formulation of different flip-flops will be a part of design.
- Students will learn the technical issues related to simulations for various types of digital circuits using VHDL software.
- Functioning and trouble shooting of the registers and other memory units through trainer-kits and on-hand practices.
- The real digital world technical issues related to design, analysis, simulation and applications will be the major attractions of this course.

F. Recommended Study Material:

❖ **Reference Books:**

1. M. Morris R. Mano (5th Edition) PEARSON Pub, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog.
2. Malvino & Leach, THI-1999, Digital Principles and Application.
3. A. Anandkumar, Fundamental of Digital Electronics.
4. R.P.Jain, Modern Digital Electronics.

❖ **Web Materials:**

1. http://nptel.ac.in/courses/117106086/1
2. http://uotechnology.edu.iq/appsciences/Laser/Lacture_laser/four_class/digital_electronics/digital_electronics.pdf
3. http://www.32x8.com/
4. http://nptel.ac.in/courses/106105083/

IT242: JAVA PROGRAMMING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	4	-	8	6
Marks	100	100	-	200	

A. Objective of the Course:

This subject introduces OOP using Java as the implementation language. It emphasizes proper formulation and abstraction of the problem domain in the programming process in order to build programs that are robust, secure, and portable.

The objective of course is,

- To teach the model of object oriented programming concepts like abstract data types, encapsulation, inheritance and polymorphism.
- To deliver the knowledge about fundamental features of core Java like object classes and interfaces, exceptions, libraries of object collections ,GUI and Lambda Expression.
- To teach how to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.
- To demonstrate how to test and prepare a real time application using java.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Fundamental of Object Oriented Programming	04
2.	Class Fundamentals	10
3.	Array & String Handling	06
4.	Inheritance, Interfaces & Packages	08
5.	Exceptions Handling	04
6.	A Quick start to Lambdas and Streams	08
7.	GUI Programming ,Applets, JFC	08
8.	Multithreaded Programming	08
9.	Java Collection Framework	04

Total hours (Theory): 60
Total hours (Lab): 60
Total hours: 120

C. Detailed Syllabus:

1.	**Fundamental of Object Oriented Programming** History of Java, Basic overview of java, Bytecode, JVM, Buzz-words, Application and applets, Constants, Variables & Data Types, Comments, Operators, Control Flow	**04 hours**	**06 %**
2.	**Class Fundamentals** General form of class, Creating class Overloading methods, Constructor, Declaring Object, Returning objects, using objects as parameters, Assigning object reference variables, Introducing Access control , Understanding static, Introducing final, The finalize ( ) method, The this keyword, Garbage collection	**10 hours**	**20 %**
3.	**Array & String Handling** Array basics, String Array, String class, StringBuffer class, String Tokenizer Class and Object Class	**06 hours**	**10 %**
4.	**Inheritance, Interfaces & Packages** Inheritance: Using super creating multilevel Hierarchy, method overriding, Dynamic method dispatch, abstract classes, Using final with Inheritance, Using Package: Defining package, Finding package and CLASSPATH, Access protection, Importing package, Interface: Defining Interface, Implementing Interface, Variables in Interface	**08 hours**	**13 %**
5.	**Exceptions Handling** Exception types, Try ...Catch...Finally, Throw, Throws, creating your own exception subclasses	**04 hours**	**06 %**
6.	**A Quick start to Lambdas and Streams** Introduction to Annotation, Byte streams and character streams, Wrapper classes , Why Lambda Expression, Lambda Expression Syntax, Where to use lambda expression, Adopting Patterns like matching, finding and filtering,	**08 hours**	**13 %**
7.	**GUI Programming ,Applets, JFC** – AWT Classes, Window Fundamentals (Component, Container, Panel, Window, Frame, Canvas) – Working with Frame , Windows, Creating a Frame window in an Applet – Working with Graphics(Drawing Lines, Rectangles, Ellipses, Circles, Arcs, Polygons, Sizing Graphics) – Working with Color, Working with Fonts,	**08 hours**	**13 %**

- Understanding layout managers, Labels, Button, Checkbox, Choice Controls, Text Field, Text Area, Menu Bars, Dialog Boxes, File Dialog
- Delegation event model (Event, Event Source, Listener), Event Classes, Sources of events ,Event Listener Interfaces
- Adapter classes, Inner classes and anonymous inner class
- Applet Class, Applet Architecture, Life cycle of applet, Simple Applet Display methods
- Designing a Web page using Applet Tags, Running the Applet, Passing Parameter to Applet, More about HTML tags
- Swing overview ,Swing component classes: AbstractButton, ButtonGroup, ImageIcon, JApplet,Jbutton, JcheckBox, JcomboBox, Jlabel, JradioButton, JscrollPane, JtabbedPane, Jtable, JtextField,Jtree

8.	**Multithreaded Programming** Life cycle of thread, thread methods, thread priority, thread exceptions, Implementing Runnable interface, Synchronization	**08 hours**	**13 %**
9.	**Java Collection Framework** Collection, Array List, Date	**04 hours**	**06 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- Faculty deals with concept test as it implies focus on one key concept of learning
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.

- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

By taking this course Programming in Java,

- Students will be able to use APIs through Javadoc.
- Student will be able to implement standalone application, GUI based application as well as multithreaded programming for real life projects using core features of Java.
- Students will be able to design and develop projects in higher semesters using Object oriented design approach and java programming language.

F. Recommended Study Material:

❖ **Text Books:**

1. HeadFirst Java Programming – O'relly publication
2. Thinking inJava - Bruce Eckel, Prentice Hall
3. SCJP Java Programming-Khalid A. Mughal

❖ **Reference Books:**

4. Teach yourself Java - by Joseph O'neil, TMH publication
5. Java Concurrency in Practice – Brian Goetz, Pearson Publication
6. The Complete Reference Java 2 ,Herbert Schildt ,TMH publication

❖ **Web Materials:**

1. www.java.sun.com,
2. www.javaarchives.com,
3. www.docs.oracle.com/javase/tutorial/

IT243: DATA COMMUNICATION

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The principles of data communications are carefully and thoroughly explored which can be applied to the complex systems found in communication networks and computer-communication architectures.

The main objective to give the course is

- To make them familiar with basic need of communication and networking.
- To familiarize students with the concepts of circuits, signals, multiplexing, etc.
- To identify different types of network topology.
- To be able to apply the concepts of data communication system theoretically and practically as well.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Data Communications	04
2.	Network Models	06
3.	Signals	06
4.	Signal Encoding Techniques	07
5.	Communication Channel Characteristics	05
6.	Bandwidth Utilization: Multiplexing and Spectrum Spreading	10
7.	Transmission Media	07
8.	Switching	06
9.	Error Detection and Correction	05
10.	Connecting Devices and Virtual LANs	04

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1.	**Introduction to Data Communications** Data Communications, Networks, Network Types, Standards And Administration	**04 hours**	**06%**
2.	**Network Models** Protocol Layering, TCP/IP Protocol Suit, The OSI Model	**06 hours**	**12%**
3.	**Signals** Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission Impairments, Data rate limits, Performance	**06 hours**	**12%**
4.	**Signal Encoding Techniques** Digital Transmission: Digital to Digital Conversion, Analog to Digital Conversion, Transmission modes Analog Transmission: Digital to Analog Conversion, Analog to Analog Conversion	**07 hours**	**14%**
5.	**Communication Channel Characteristics** Electromagnetic waves, Frequency and Wavelength, Bandwidth and Channel Capacity, Bandwidth and Distance	**05 hours**	**08%**
6.	**Bandwidth Utilization: Multiplexing and Spectrum Spreading** Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing Spread Spectrum: Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum	**10 hours**	**14%**
7.	**Transmission Media** Guided Media: Twisted - Pair Cable, Coaxial Cable, Fiber - Optic Cable, Unguided media: Radio Waves, Microwave and Infrared	**07 hours**	**13%**
8.	**Switching** Introduction, Circuit-Switched Networks, Packet Switching, Structure of a Switch	**06 hours**	**08%**
9.	**Error Detection and Correction** Types of Errors, Detection, Parity Check, Vertical Redundancy Check, Cyclic Redundancy Check, Error Correction	**05 hours**	**10%**
10.	**Connecting Devices and Virtual LANs** Repeaters, Hub, Bridges , Switches, Routers, Gateways, Brouters, Virtual LANs	**04 hours**	**03%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Faculty would use campus based learning as it uses campus environment itself as a teaching tool. Also use of teaching with visualization is done as it helps students to see how real network systems work.
- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

By taking this course,

- Students will be able to apply the concept of amplifier and circuits.
- Students are able to perform various electronic circuits' related exercise.

F. Recommended Study Material:

❖ **Text Books:**

1. Data Communication and Networking, Behrouz Forouzan, McGraw Hill Publication

❖ **Reference Books:**

2. Electronic Communications, Kennedy McGraw Hill Publication.
3. Data Communication By William Schweber, McGraw Hill Publication

❖ **Web Materials:**

1. www.wikipedia.org
2. http://www.webopedia.com

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IT244: SOFTWARE GROUP PROJECT- I

Credit and Hours:

Teaching Scheme	Theory	Project	Total	Credit
Hours/week	-	4	4	2
Marks	-	50	50	

A. Objective of the Course:

The main objectives for offering the course software project are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently
- To provide exposure in the field of Software development
- To provide a deep understanding of various domains of software projects.
- To provide an innovative ability to solve practical/utility problems
- To provide a capacity to learn continually and interact with multidisciplinary groups

B. Outline of the Course:

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on weekly basis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.
- Students have to submit project with following listed documents at the time of final submission.
    a. Project Synopsis
    b. Software Requirement Specification

c. SPMP

d. Final Project Report

e. Project Setup file with Source code

f. Project Presentation (PPT)

- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00

Total hours (Lab): 60

Total hours: 60

C. Instructional Method and Pedagogy:

1. Project Groups would be form of maximum two students.
2. Inter batch group formation is not permitted due to difficulties in progress tracking.
3. Students are advised to choose innovative and challenging definitions.
4. Batch wise project definitions must be unique.
5. Any kind of management system would not be encouraged.
6. Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
7. Student has to prepare report at end of semester as part of submission.
8. Report structure is finalized for semester end submission.
9. To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
10. To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check (iThenticate/ Turnitin report) before 15 days of external exam.
11. Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
12. Students have to bring internal review card hard copy on the day of internal review exam, after that they will attach filled review card in their final project report.

D. Student Learning Outcome:

After the completion of the course students will able to

- Explore the new ideas & the possible areas to work ahead.
- Use the various methodologies useful for doing project work.
- Investigate the chosen topic in depth. This implies collecting and reviewing literature and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or project topic.
- Apply the concepts and theories learnt in previous years of study and work placements

E. Recommended Study Material:

1. Reading Materials, web materials, Project reports with full citations
2. Books, magazines & Journals of related topics
3. Various software tools and programming languages compiler related to topic

URL Links:

1. www.ieeexplore.ieee.org
2. www.sciencedirect.com
3. www.elsevier.com
4. http://spie.org/x576.xml

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

MA244: STATISTICAL AND NUMERICAL TECHNIQUES

Credits and Hours:

Teaching Scheme	Theory	Tutorial	Total	Credit
Hours/week	4	0	4	4
Marks	100	-	100	

A. Objective of the Course:

This course is the foundation of the course of higher semester courses of B. Tech. (IT) viz. (i) Data-mining (ii) Artificial Intelligence (iii) Image Processing and related courses.

The objectives of the course are to:

1. develop motivation towards Statistical and Numerical techniques
2. understand basics of Statistical Methods
3. understand the concepts of Probability and its use
4. understand Computing Probabilities of various random events
5. understand concept of Statistical Hypothesis Test

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Basic Statistics and Introduction to Probability	09
2.	Random variables and Probability distributions	12
3.	Regression and Correlation	09
4.	Interpolation, Curve fitting	15
5.	Numerical Integration, solution of equations	15

Total hours: 60

C. **Detailed Syllabus:**

1.	**Basic Statistics and Introduction to Probability**	**09 Hours**	**16%**
1.1	Descriptive Statistics and Exploratory Analysis		
1.2	Methods of Enumeration: Permutations and Combinations		
1.3	Introduction to Probability and Properties of Probability		
1.4	Conditional Probability		
1.5	Independent Events		
1.6	Baye's Theorem		
2.	**Random variables and Probability distributions**	**12 Hours**	**18%**
2.1	Discrete and continuous random variable, expected values and variance of random variable, Probability mass function, Probability density function and Cumulative distribution functions,		
2.2	Probability distributions of discrete random variable: Bernoulli, Binomial, Poisson and Geometric		
2.3	Probability distributions of continuous random variable: Uniform, Normal, and Exponential		
2.4	Introduction to Statistical Inference: Point Estimation and Interval Estimation, Test of Statistical Hypothesis		
3.	**Regression and Correlation**	**09 Hours**	**16%**
3.1	Measure of association between two variables. Types of correlation, Karl Pearson's Coefficient of correlation and its mathematical properties.		
3.2	Spearman's Rank correlation and its interpretations.		
3.3	Regression Analysis: Concept and difference between correlation and regression, linear regression equations, properties of regression coefficients		
4.	**Numerical methods, Interpolation, Curve fitting**	**15 Hours**	**25%**
4.1	Introduction, Errors in numerical methods, Finite differences and associated operators		
4.2	Interpolation, Newton's forward interpolation formula, Newton's backward interpolation formula, Extrapolation		

4.3 Lagrange's interpolation formula and Newton's divided difference formula

4.4 Least squares curve fitting methods, linear and nonlinear curve fitting.

5. Numerical Integration and Numerical solution of Equations **15 Hours** **25%**

5.1 Numerical Integration: Newton's quadrature formula, Composite rules: Trapezoidal rule and Simpson's rules

5.2 Solution of linear system: Gauss Jordan Method and Gauss Seidel Method

5.3 Numerical Solution of Non-linear Equations: Newton-Raphson, False position (Regula Falsi) and Bisection method

5.4 Numerical Solution of Ordinary Differential Equations: Taylor's series, Euler's, and Runge- Kutta (4^{th} order) methods.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures/laboratory which carries a 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Two Quizzes (surprise tests) will be conducted which carries 5% component of the overall evaluation.

E. Student Learning Outcomes:

- At the end of course students will able to grasp, analyze, formulate and solve mathematical/statistical problems related to Information Technology.
- At the end of the course the students will be able to frame the fundamental algorithms/programming of Numerical analysis.

F. Recommended Study Material:

❖ Reference Books:

1. Johnson, Richard A. Miller and Freund" s Probability and Statistics for Engineers. Prentice Hall, 1994.
2. Hogg, Robert V., Elliot Tanis, and Dale Zimmerman. Probability and statistical inference. Pearson Higher Ed, 2014.
3. Sheldon, Ross. A first course in probability. Pearson Education India, 2002
4. Trivedi, Kishor S. Probability & statistics with reliability, queuing and computer science applications. John Wiley & Sons, 2008.
5. Chapra, Steven C., and Raymond P. Canale. Numerical methods for engineers. Vol. 2. New York: McGraw-Hill, 2012.
6. Sastry, Shankar S. Introductory methods of numerical analysis. PHI Learning Pvt. Ltd., 2012.
7. Rajaraman, Vaidyeswaran. Computer oriented numerical methods. PHI Learning Pvt. Ltd., 1993.

❖ URL Links:

1. http://numericalmethods.eng.usf.edu
2. http://mathworld.wolfram.com/
3. http://en.wikipedia.org/wiki/Math

IT245.01: COMPUTER ORGANIZATION & MICROPROCESSOR INTERFACING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Computer Organization & Microprocessor are:

- To explore the basic concepts of computer organization & computer architecture design, Computer System Components: Processor, Memory, and I/O Devices, Performance evaluation
- To provide insight details in Processor Components : Control Unit, Registers, Caches Memory, ALU, Instruction Execution Unit.
- To provide introduction to Instruction Set Architecture and Practical exposure through simulation tools/Microprocessor Kits

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Computer Architecture	04
2.	Instruction Set Architecture	08
3.	Computer Architecture Space	04
4.	Performance Measures	04
5.	Basics of Arithmetic Logic Unit	08
6.	Processor Design	08
7.	Pipelined Processor	04
8.	Memory Hierarchy	05

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	**Introduction to Computing Systems** What is Computer Architecture, Abstraction :Software & Hardware, Architecture Levels, Embedded Computers, Different types of processors, Five generation computers, Growth in DRAM Capacity, Early Computer Inventions: UNIVAC,360 CDC6600,ILLIAC IV,PDP 8 HP 2115, Recursive Programs: Activation Record, Calls, Returns(after instruction set architecture) Looking into future: Grid Computing, Nano Computing, DNA Computing, Quantum Computing	**04 Hours**	**8%**
2.	**Instruction Set Architecture** Instruction for arithmetic, Instructions to move data, Instruction for decision making, Handling Constant Operands, Implementing loops, pointers Vs Index, Switch Statement, Addresses in MIPS Instructions, Procedural abstractions, Requirements, Sorting example, Register use conventions.	**08 Hours**	**20%**
3.	**Computer Architecture Space** Architecture Space: MIPS ISA Features, Alternative Architectures Architecture Examples: RISC and CISC, PowerPC, VAX,SPARC, Intel x86	**04 Hours**	**7%**
4.	**Performance Measures** Performance and Cost, Purchasing perspective, Design perspective Notions of Performance: Latency and throughput, Performance and time, computer clocks, Computing CPU time and cycles, Improving Performance, Linking instruction, cycles and time, CIPS and MIPS examples, Computer Benchmarks, Sources of Benchmark: SPEC 89 and SPEC 95, Amdahl's law, Estimating performance improvements, poor performance metrics	**04 Hours**	**7%**
5.	**Basics of Arithmetic Logic Unit**	**08 Hours**	**20%**

	Binary Arithmetic, ALU Design, Signed Operations and Overflow, Multiplier Design, Divider Design, Fast Addition, Multiplication, Floating Point representation and operations, Floating Point Unit Design, Floating Point Arithmetic		
6.	**Processor Design** Introduction, Simple Design Multi cycle approach, control for multi cycle, Micro-programmed Control, Exception Handling	**08 Hours**	**20%**
7.	**Pipelined Processor** Basic Design Idea, Data path and Control, Handling Data Hazards, handling Control Hazards	**04 Hours**	**8%**
8.	**Memory Hierarchy** Basic Idea: Memory construction, size, speed,cost and data unit. Tradeoffs between them.PROM, EEPROM, DRAM, SRAM ,Memory Technologies, Hierarchical organization, principle of locality, Simple Cache organization, Miss rate, block size, cache policies Cache Organization: Mapping alternatives- direct, associative and set associative, processor performance with cache, memory organization and miss penalty, Policies for read, load, fetch, replacement and write, How Caches work, Size of tags, Performance analysis examples Virtual Memory: Similarities and differences of Virtual Memory and Cache, Mapping Virtual address to physical address, Page tables, TLB, Virtually addressed cache, Memory Protection	**05 Hours**	**10%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weight.
- Assignments/ Surprise tests/Quizzes/Seminar based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

By taking this course Computer Organization and Microprocessor

- Students will able to understand the concepts of Computer Organization.
- Students will use knowledge of internal architecture of the system to develop an assembly language programs

F. Recommended Study Material:

❖ **Text Books:**

1. John L. Hennesy & David A. Patterson, "Computer Organization & Design : The Hardware / Software Interface", Morgan Kaufmann Publishers, 2004.
2. R. E. Bryant and D. R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall
3. Computer Organization & Architecture-Designing for Performance, William Stalling, Pearson Prentice Hall(8th Edition).

❖ **Reference Books:**

4. Introduction to Computing Systems: From Bits and Gates to C and Beyond, Yale N. Patt,Sanjay J. Patel, 2nd Edition, Tata McGraw-Hill Publication,2005.
5. Structured Computer Organization, A. S. Tananbum , Pearson Education
6. The Essentials of Computer Organization And Architecture, Linda Null, Julia Lobur, Jones & Bartlett Learning, 2006
7. Computer Architecture & Organization, John P Hayes, McGraw-Hill.
8. Computer System Architecture, Morris Mano (3rd Edition) Prentice Hall.

❖ **Web Materials:**

1. http://nptel.ac.in/courses/106102062/37
2. http://highered.mcgraw-hill.com/sites/0072467509/

IT246: WEB ENGINEERING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	-	6	4
Marks	100	100	-	200	

A. Objective of the Course:

The main objectives for offering the course Web Technology are:

- To introduce various Web Server Protocol and Web Architecture.
- To have hands on experience for HTML and DHTML using CSS, PHP this will help them to prepare website and web base applications.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to WWW	02
2.	Web server , Access and security, Web Protocol(HTTP/1.1)	02
3.	HTML 4.0/5.0	04
4.	Cascaded Style Sheet (CSS2.0/3.0)	05
5.	Client side Scripting Language(JavaScript)	08
6.	DOM (Document Object Model)	01
7.	Server Side Language (PHP)	03
8.	MySQL and PHP Database	05

Total hours (Theory): 30
Total hours (Lab): 60
Total hours: 90

C. Detailed Syllabus:

1.	**Introduction to WWW** Web Related browser functions, Browser Configuration, Browser Security Issues, Cookies, Spider, Intelligent Agents and special purpose browsers	**02 hours**	**07 %**
2.	**Web server , Access and security, Web Protocol(HTTP/1.1)** Introduction WAMP, IIS7.0/7.5, Overview Of HTTP, HTTP Language Elements, HTTP Extensibility, SSL and Security, Evolution of HTTP/1.1 Protocol, Methods-Headers and Response codes in 1.0 /1.1, Caching, Bandwidth Optimization, Connection Management	**02 hours**	**07 %**
3.	**HTML4.0/5.0** HTML Headings, HTML Paragraphs, HTML Formatting, HTML Fonts, HTML Styles, HTML Links, HTML Images, HTML Tables, HTML Lists, HTML Forms HTML Frames, HTML iframes	**04 hours**	**14 %**
4.	**Cascaded Style Sheet (CSS2.0/3.0)** CSS Introduction, CSS Syntax, CSS Id & Class, CSS Box Model(CSS Border, CSS Outline, CSS Margin, CSS Padding), CSS Styling(Backgrounds, Text, Fonts, Links, Lists, Tables). Advance CSS: Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar, Image Gallery, Image Opacity, Image Sprites, Media Types, Attribute Selectors. CSS3 Introduction CSS3 Borders, CSS3 Backgrounds, CSS3 Text Effects, CSS3 Fonts, CSS3 2D Transforms, CSS3 3D Transforms, CSS3 Transitions, CSS3 Animations, CSS3 Multiple Columns, CSS3 User Interface.	**05 hours**	**16 %**
5.	**Client side Scripting Language(JavaScript)** Introduction to JavaScript: What Is JavaScript, What Can JavaScript Do for Me? Linking to an External JavaScript File, Advantages of Using an External File Types of Data in JavaScript: Numerical Data, Text Data, Boolean Data Variables: Creating Variables and Giving Them Values, Assigning Variables with the Value of Other Variables, Calculations and Basic String Manipulation: Numerical Calculations, Basic String Operations, Mixing Numbers and Strings Data Type Conversion: Dealing with Strings That Won't Convert	**08 hours**	**26 %**

	Decisions, Loops, and Functions: if...else, for loop for...in Loop, switch...case, while Loop, do...while loop, break and continue Statements, Creating function with and without arguments. Error Handling: Preventing Errors, The try ... catch Statements Interactive HTML Form and Validation: Button Elements, Text Elements, The textarea Element, Check Boxes and Radio Buttons, Selection Boxes,validation. JavaScript object: String, Array, Regular Expression		
6.	**DOM (Document Object Model)** Introduction to Document Object Model, HTML DOM, Java Script DOM	**01 hour**	**03 %**
7.	**Server Side Language (PHP)** Introduction to server side language, PHP Syntax, Operator and Control statements, PHP Loops, function, PHP String manipulation, Arrays-Enumerated Arrays, Associative array, array iteration, Multi-dimensional array, Array functions.Date and Time & String functions.	**03 hours**	**11 %**
8.	**MySQL and PHP Database** PHP session and cookies management, PHP File handling, Introduction and Configuration of MySql, MySQL Database operation-Connect, Create, Insert, Select, Where, Order By, Update, Delete	**05 hours**	**16 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will able to develop static and dynamic website and web base software applications.
- Students will use knowledge of the subject in higher semester for subjects like Advance Java Technology and .Net Web technology and also for Project development.

F. Recommended Study Material:

❖ **Text Books:**

1. Learning JQuery Third Edition, Jonathan Chaffer Karl Swedberg, Packt Publishing
2. HTML 4 , Bryan Pfaffenberge, Bible
3. Beginning JavaScript –4th Edition by Paul Wilton, Jeremy McPeak - Wrox Publication
4. Beginning PHP 5.3 - WroxByMatt Doyle.
5. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein - Sitepoint publication

❖ **Reference Books:**

6. JavaScript Bible- Gold Edition by Danny Goodman
7. CSS Cook book By Christopher Schmitt -O'Reilly publication
8. jQuery Cookbook - O'Reilly Media by Cody Lindley

❖ **Web Materials:**

1. www.w3schools.com
2. www.tutorialspoint.com

IT247.01: DATA STRUCTURES AND ALGORITHMS

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

This course will introduce some of the most fundamental concepts in Computer Science like how data is represented and manipulated in computer systems in the form of stacks, queues, linked lists, tree, graph etc. To provide an in-depth knowledge in problem solving techniques and data structures.

The main objective to give the course is:

- To familiarize students with basic data structures and their use in fundamental algorithms.
- To teach the students how to select and design data structures and algorithms for a specified problem.
- To teach the students how data will be stored efficiently within computer memory.
- To select appropriate data structure and algorithm for a specified application.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction to Data Structure	04
2.	Linear Data Structure	15
3.	Non Linear Data Structure	10
4.	Searching and Sorting	10
5.	Hashing	06

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1. INTRODUCTION TO DATA STRUCTURE **04 hours** **07 %**

1.1 **Introduction**

Introduction to Data, Information, Data Type

Different types of Data Type : Built-In and Abstract Data Type

1.2 **Algorithm and Data Structure**

Algorithm, Program

Introduction to Data Structure

Needs for Data Structure

Different types of Data Structure

2. LINEAR DATA STRUCTURE **15 hours** **33 %**

2.1 **Array**

Notations : one dimension, two dimension and multi dimension

Memory Representation of Array : Row Order and Column Order

Concept of Sparse Matrices

2.2 **Stack**

Memory Representation of Stack

Operations : push, pop, peep, change

Applications of Stack:

Recursion : Recursive Function Tracing, Tower of Hanoi

Conversion : Infix to Postfix

Evaluation : Prefix and Postfix expression

2.3 **Queue**

Memory Representation of queue

Simple Queue : Insert and Delete operation

Circular Queue : Insert and Delete operation

Concepts of : Priority Queue, Double-ended Queue

Applications of Queue

2.4 **Linked List**

Memory Representation of LL

Singly Linked List: Insert at First, Insert at End, Insert according to Sorted order, Delete the specified node.

Doubly Linked List : Insert and Delete operation

Concept of Circular Linked List

Applications of Link List

3.	**NON LINEAR DATA STRUCTURE**	**10 hours**	**25 %**
3.1	**Tree** Tree Concepts (Tree, Binary, Full Binary, Complete Binary) Memory Representation of Tree Tree Traversal Techniques : Pre-order, Post-order and In-order (Recursive and Iterative) Binary Search Tree: Iterative and Recursive: Insert and Delete Operations with all options. Concept of Threaded Binary Tree, B- Tree General Tree to Binary Tree Conversion Height-Balance Tree(AVL Tree) : Insert and Delete Operations Applications of Tree : Manipulation of Arithmetic Expression, Decision Tree, Hierarchical Tree(Family Tree), Directory structure of File system		
3.2	**Graph** Graph concepts (undirected, directed, simple, multi, weighted, null, mixed, cycle, path, forest) Memory Representation of Graph, BFS and FS, Applications of Graph		
4.	**SEARCHING AND SORTING**	**10 hours**	**25 %**
4.1	**Searching** Sequential Search ,Binary Search : Iterative and Recursive		
4.2	**Sorting** Different Sorting Techniques Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Radix Sort, Heap Sort		
5.	**HASHING**	**06 hours**	**10 %**
5.1	**Hashing** Collision-Resolution Techniques : rehashing and chaining Different Hashing Functions: Division, Mid-square, Folding, Length-dependent, Digit Analysis, Multiplicative Applications of Hashing		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Faculty would use coached problem solving method as it is class format in which faculty provide a structured, guided context for students working collaboratively to solve problems.

- Attendance is compulsory in lectures and laboratory which carries 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weight age of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will able to select and use appropriate data structures that efficiently address program requirements.
- Students will be able to identify and implement the algorithm, (basic operations) for manipulating each type of data structure.
- Student will be able to synthesize efficient algorithms in common engineering design situations.

F. Recommended Study Material:

❖ **Text Books:**

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson, McGraw-hill.

❖ **Reference Books:**

1. Classic Data structures, D.Samanta, Prentice-Hall International.
2. Data Structures using C & C++, Ten Baum, Prentice-Hall International.
3. Data Structures Using C, Oxford Higher Education, Reema Thareja
4. Data Structures: A Pseudo-code approach with C, Gilberg & Forouzan, Thomson Learning.

5. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, W. H. Freeman.
6. Data Structure through C (A Practical Approach) , Dhanpat Rai & Co., G. S. Baluja

❖ **Web Materials:**

1. http://www.itl.nist.gov/div897/sqg/dads
2. http://www.leda-tutorial.org/en/official/ch02s02s03.html
3. http://www.leda-tutorial.org/en/official/ch02s02s03.html
4. http://www.softpanorama.org/Algorithms/sorting.shtml

IT248.01: DATABASE MANAGEMENT SYSTEM

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	-	150	

A. Objective of the Course:

Databases are store house or repository for organizational information. Storing and efficient usage of information is crucial for any system. All organizations, large and small, must rely on data management in all aspects of business operations and management information systems.

The main objectives for offering the course Database Management System are:

- To understand the overall structure and design of DBMS software.
- To cover three major aspects of data: concurrency, integrity, and recovery.
- To give the motivations behind development of DBMS and Structured Query Language used with relational databases.
- To make students familiar with the concepts of database in computerized application.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introductory concepts of DBMS	05
2.	Entity-Relationship model	05
3.	Formal Relational Query Languages	05
4.	Relational Database Design	10
5.	Transactions	08
6.	Concurrency Control	08
7.	Recovery System	04

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	**Introductory concepts of DBMS** Introduction and applications of DBMS, Purpose of database, Data Independence, Database System architecture- levels, Mappings, Database users and DBA	**05 hours**	**10 %**
2.	**Entity-Relationship model** Basic concepts, Design process, Constraints, Keys, Design issues, E-R diagrams, Weak Entity Sets, Extended E-R features- Generalization, Specialization, Aggregation, Reduction to E-R database schema	**05 hours**	**10 %**
3.	**Formal Relational Query Languages** Structure of Relational Databases, Domains, Relations, Relational Algebra fundamental Operators and Syntax, Relational algebra queries	**05 hours**	**10 %**
4.	**Relational Database design** Functional Dependency–definition, Trivial and Non-Trivial FD, Closure of FD set, Closure of attributes, Irreducible set of FD, Normalization – 1NF,2NF,3NF, Decomposition using FD- Dependency Preservation, Multi-valued dependency& 4NF, Join Dependency &5NF	**10 hours**	**22 %**
5.	**Transactions** Transaction concepts, A Simple Transaction Model, Properties of Transactions, Serializability of transactions, Testing for Serializability	**08 hours**	**20%**
6.	**Concurrency Control** Lock-Based Protocol, Timestamp-Based Protocol, Multiple Granularity, Deadlock Handling	**08 hours**	**20%**
7.	**Recovery System** Failure Classification, Recovery and Atomicity, Log-based recovery, Transaction rollback and checkpoints, System recovery	**04 hours**	**08%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc. Faculty would use the approach teaching with data as it would help to find and integrate real data sets into their classes.
- Attendance is compulsory in lectures.

- Internal exams/Unit tests/Surprise tests/Quizzes/Seminar/Assignments etc. will be conducted as a part of continuous internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will able to translate written business requirements into conceptual entity-relationship data models.
- Students will able to analyze business requirements and produce a viable model
- Students will able to convert conceptual data models into relational database schemas using the SQL Data Definition Language (DDL).
- Student will able to utilize database design and development skills for development of software projects.
- Students will able to utilize memory efficiently by appropriate database design.

F. Recommended Study Material:

❖ **Text Books:**

1. Database System Concepts, Abraham Silberschatz, Henry F. Korth& S. Sudarshan, McGraw Hill.
2. An introduction to Database Systems, C J Date, Addition-Wesley

❖ **Reference Books:**

3. "Fundamentals of Database Systems",R. Elmasri and S.B. Navathe, The Benjamin / Cumming Pub. Co
4. SQL,PL/SQL the Programming Language of Oracle,IvanBayross, BPB Publications
5. Oracle: The Complete Reference, George Koch, Kevin Loney, Oracle Press.

❖ **Web Materials:**

1. http://www.sql.org
2. http://www.w3schools.com
3. http://www.sqlcourse.com

IT249: SOFTWARE GROUP PROJECT

Credit and Hours:

Teaching Scheme	Theory	Project	Total	Credit
Hours/week	-	4	4	2
Marks	-	50	50	

A. Objective of the Course:

The main objectives for offering the course software project are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently
- To provide exposure in the field of Software development
- To provide a deep understanding of various domains of software projects.
- To provide an innovative ability to solve practical/utility problems
- To provide a capacity to learn continually and interact with multidisciplinary groups

B. Outline of the Course:

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work on weekly basis to the respective internal guide.
- Project will be evaluated at least once per week in laboratory hours during the semester and final submission will be taken at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.
- Students have to submit project with following listed documents at the time of final submission.
    g. Project Synopsis

h. Software Requirement Specification

i. SPMP

j. Final Project Report

k. Project Setup file with Source code

l. Project Presentation (PPT)

- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00

Total hours (Lab): 60

Total hours: 60

C. Instructional Method and Pedagogy:

1. Project Groups would be form of maximum two students.
2. Inter batch group formation is not permitted due to difficulties in progress tracking.
3. Students are advised to choose innovative and challenging definitions.
4. Batch wise project definitions must be unique.
5. Any kind of management system would not be encouraged.
6. Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
7. Student has to prepare report at end of semester as part of submission.
8. Report structure is finalized for semester end submission.
9. To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
10. To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check (iThenticate/ Turnitin report) before 15 days of external exam.
11. Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.

12. Students have to bring internal review card hard copy on the day of internal review exam, after that they will attach filled review card in their final project report.

D. Student Learning Outcome:

After the completion of the course students will able to

- Explore the new ideas & the possible areas to work ahead.
- Use the various methodologies useful for doing project work.
- Investigate the chosen topic in depth. This implies collecting and reviewing literature and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or project topic.
- Apply the concepts and theories learnt in previous years of study and work placements

E. Recommended Study Material:

1. Reading Materials, web materials, Project reports with full citations
2. Books, magazines & Journals of related topics
3. Various software tools and programming languages compiler related to topic

❖ **URL Links:**

1. www.ieeexplore.ieee.org
2. www.sciencedirect.com
3. www.elsevier.com
4. http://spie.org/x576.xml

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 5)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT341: DESIGN & ANALYSIS OF ALGORITHM

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Design and Analysis of Algorithm are

- To explain the fundamentals of computer algorithm and create analytical skills, enable students to design algorithms for various applications, and analyze the algorithms.
- To introduce mathematical aspects and analysis of algorithms, sorting and searching algorithms, algorithmic techniques and algorithmic design methods which help in development of software.

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Basics of Algorithm and Mathematics	04
2.	Analysis of Algorithm	12
3.	Divide and Conquer Algorithm	10
4.	Greedy Algorithm	08
5.	Dynamic Programming	10
6.	Exploring Graphs	08
7.	String Matching and NP Completeness	08

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

C. Detailed Syllabus:

1.	**Basics of Algorithm and Mathematics**	**04 hours**	**07%**
1.1	What is an algorithm?		
1.2	Mathematics for Algorithm		
1.3	Performance Analysis, Model for Analysis - Random Access Machine (RAM), Primitive Operations		
1.4	Time Complexity and Space Complexity		
2.	**Analysis of Algorithm**	**12 hours**	**20%**
2.1	The efficiency of algorithm, Best, Average and Worst case Analysis		
2.2	Asymptotic Notation		
2.3	Solving Recurrence Equation		
2.4	Sorting Algorithm		
3.	**Divide and Conquer Algorithm**	**08 hours**	**13%**
3.1	Basic of Recursion and its complexity		
3.1	The general template for Divide and Conquer Problem		
3.2	Problem solving using divide and conquer algorithm – Binary Search, Sorting - Merge Sort and Quick Sort		
3.3	Strassen'sMatrix Multiplication		
4.	**Greedy Algorithm**	**10 hours**	**17%**
4.1	General Characteristics of greedy algorithms		
4.2	Problem solving using Greedy Algorithm: Making change problem		
4.3	The Knapsack Problem, Job Scheduling Problem		
4.4	Minimum Spanning Trees (Kruskal's Algorithm, Prim's Algorithm)		
4.5	Dijkstra Algorithm		
5.	**Dynamic Programming**	**10 hours**	**17%**
5.1	Introduction, The Principle of Optimality		
5.2	Problem Solving using Dynamic Programming – Calculating the Binomial Coefficient		
5.3	Making Change Problem, Assembly Line Scheduling		

5.4 Knapsack Problem, All pair Shortest Path

5.5 Matrix Chain Multiplication

5.6 Longest Common Subsequence

6. Exploring Graphs and Backtracking **08 hours** **13%**

6.1 An introduction to Graph, Basic Definitions

6.2 Traversing Graphs – Depth First Search, Breadth First Search, Topological Sort

6.3 Backtracking – The Eight Queen Problem

6.4 **The Knapsack Problem**

6.5 Branch and Bound – The Assignment Problem

7. String Matching and NP Completeness **08 hours** **13%**

7.1 Introduction

7.2 The naïve string matching algorithm

7.3 The Rabin-Karp algorithm

7.4 Introduction to NP Complete Theory

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

- Develop efficient and effective computer algorithm. This will help for development of efficient and optimized software and problem solving approach.
- Apply their theoretical knowledge in practice (via the practical component of the course).
- Accustom to the description of algorithms in both functional and procedural styles
- Analyze algorithms and estimate their worst-case and average-case behavior

F. Recommended Study Material:

❖ **Text Books:**

1. Gills Brassard, Paul Brately, Fundamental of Algorithms, Prentice Hall of India

❖ **Reference Books:**

2. Thomas H. Coreman, Charles E. Leiserson, Ronald Rivest and Clifford Stein, Introduction to Algorithms, MIT Press
3. Ellis Horowitz, SartazSahni and SanguthevarRajasekarn Fundamental of Computer Algorithms, Computer Science Press

❖ **URL Links:**

1. http://www.itl.nist.gov/div897/sqg/dads
2. http://www.stanford.edu/class/cs161
3. http://highered.mcgraw-hill.com/sites/0073523402

IT342: ADVANCED WEB TECHNOLOGIES

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	2	-	4	3
Marks	100	50	-	150	

A. The main objective to give the course Advance Web Technology is

- Know the techniques for improving the accessibility of an HTML document
- Know the techniques involved to support reach web development application.
- Students understand the web development and database technology.
- To give the fundamental skills needed to understand the concepts of web development.

B. **Outline of the course:**

Sr No.	Title of the unit	Minimum number of hours
1.	Web Server.	01
2.	Server Side Language (PHP)-Part1	09
3.	Server Side Language (Object oriented PHP)-Part 2	06
4.	MySQL	05
5.	XML, XML Schema, XML DOM	03
6	Web services and RESTful PHP Web service	02
7.	RSS, RDF, SPARQL, OWL	04

Total hours (Theory): 30Hrs.

Total hours (Lab): 30Hrs.

Total hours: 60Hrs.

C. Detailed Syllabus:

1.	**Web Server**	**01 hours**	**3%**

Introduction, Apache Web server, IIS6.0/7.0, WAMP, XAMPP

2	**Server Side Language (PHP) Part -1**	**09 hours**	**30 %**

Embedded PHP in HTML, Adding Dynamic content, Accessing form variable, Understanding Identifier, Operator, Decision and loops, Function, Array and String manipulation, Preserving state with Query Strings, Session and cookies, Working with files and directories, Regular expression.

3	**Server Side Language (Object oriented PHP)-Part 2**	**06 hours**	**20%**

Understanding OOP concept, Creating classes ,attributes and operators, controlling access, Error and Exception handling, security and encryption (Preventing session fixation, protecting again form spoofing, input filter, cross site scripting, SQL injection, Password security), Data encryption

4	**MySQL**	**05 hours**	**17 %**

Introduction, Installation, Administration, PHP Syntax, Connection, Create Database

Drop Database, Select Database, Data Types, Create Tables, Drop Tables, Insert Query, Select Query, Where Clause, Update Query, Delete Query, Like Clause Sorting Results ,Using Join NULL Values , Transactions ,Alter Command Indexes ,Temporary Tables ,Clone Tables ,Database Info ,Using Sequences, Handling Duplicates, Database Export, Database Import, MySql useful Function

5	**XML, XML Schema, XML DOM**	**03 hours**	**10 %**

XML Introduction, How to use, XML Tree, XML Syntax, XML Elements, XML Attributes, XML Validation, XML Validator, XML Viewing, XML CSS, XSLT Introduction, XSLT Browsers, XSLT Transform, XSLT ‹template› ,XSLT ‹value-of›, XSLT ‹for-each›, XSLT ‹sort›, XSLT ‹if›, XSLT ‹choose›, DOM Introduction, Manipulate Nodes

6	**Web services and RESTful PHP Web service**	**02 hours**	**07 %**

Introduction to SOAP, WSDL and UDDI, Writing Web Services, Client, Resource Oriented Architecture, Designing Read only resource oriented Service, Web

7	**RSS, Semantic Web Programming (RDF, SPARQL and OWL)**	**02 hours**	**07 %**

RSS Introduction, RSS History, RSS Syntax , RSS ‹channel›, RSS ‹item›, RSS Publish Feed, RSS Read a Feed, Introduction to Semantic web programming, Modeling Information, RDF Rules, RDF Elements, RDF Containers, RDF Collections, RDF Schema, RDF Dublin Core, RDF OWL,

8	**JQuery and AJAX**	**02 hours**	**07 %**

Introduction, Selecting Elements, Handling Events, Styling and Animating, Manipulating the DOM, XMLHTTPRequest Object, Asynchronous HTML and HTTP, Sending Data with AJAX.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

By taking this course Advance Web Technology:

- Students will be able to use Open Source technology to develop Web application.
- Students will be provided with an up-to-date survey of developments in web technology.

F. Recommended Study Material:

❖ **Text Books:**

1. PHP5 UInleashed, John Coggeshall, ByAdam Trachtenberg, David SklarPublisher, Sams Publishing
2. PHP and MySQL Web Development ,Luke Welling, Laura Thomson, Sams Publishing
3. Beginning PHP 5.3 ,Wrox , Matt Doyle
4. Restful Web Services,Leonard Richardson, Sam Ruby, David Heinemeier Hansson,, O'Reilly

❖ **Reference Books:**

1. Learning PHP 5 David Sklar, O'Reilly
2. XML Pocket Consultant William R. Stanek , Microsoft
3. RESTful Web Services Cookbook: Solutions for Improving Scalability and Simplicity, subbu Allamaraju, O'Reilly
4. Developing Web Widget with HTML, CSS, JSON and AJAX: A Complete Guide to
5. Web Widget, Rajesh Lal , Lakshmi C Chava
6. AJAX in Practice , Dave,Crane,Bear Bibeault, Jord Sonneveld ,Manning
7. AJAX stater Kit, Phil Ballard, Sams
8. Semantic web programming John Hebeler, Matthew Fisher, Andrew Perez-Lopez, Ryan Blace, Wiley
9. Semantic web programming Toby Segaran, Colin Evans, and Jamie Taylor O'Reilly

❖ **Reference Links/ e-content:**

1. www.w3schools.com
2. www.learnphp-tutorial.com
3. http://www.designzzz.com/advance-php-tutorials-scripts/

IT343: OPERATING SYSTEM

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The operating system provides an established, convenient, and efficient interface between user programs and the bare hardware of the computer on which they run. In particular, the course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

The main objective of the course is,

- To give the fundamental knowledge of how operating system manages the applications that are running. Set a suitable environment for applications to run.
- To understand process management, memory management including virtual memory, protection and security management

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction	03
2.	System Structures	03
3.	Process Management	06
4.	Process scheduling	06
5.	Process Coordination	06
6.	Deadlocks	06
7.	Memory Management	15
8.	File System	06
9.	Secondary Storage Structure & I/O systems	06
10.	System Security	03

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1.	**Introduction** What is Operating System & evolution of OS, Computer-System Organization & Architecture, OS Structure & Operations, Special purpose Systems, Open source OS	**03 hours**	**05 %**
2.	**System Structures** OS Services, System calls, Types of system calls, OS Structure: Layered, Microkernel, Operating system Generation, Booting	**03 hours**	**05 %**
3.	**Process Management** Process, Process Control Block, Process States, Scheduling concepts, Process creation Threads, Types of Threads, Multithreading, Issues & termination	**06 hours**	**10 %**
4.	**Process scheduling** Concept, Scheduler, Preemptive Scheduling, Criteria, Scheduling Algorithms: FCFS, SJF, RR, Priority, Multi-queue	**06 Hours**	**10 %**
5.	**Process Coordination** Race Conditions, Critical Section, Peterson's Solution, Hardware Solution, Strict Alternation, Semaphores Classical IPC Problems: The Bounded-Buffer (Producer Consumer) Problem, Reader's & Writer Problem, Dinning Philosopher Problem, Monitors	**06 hours**	**10 %**
6.	**Deadlocks** Deadlock Problem, Deadlock Characterization, Resource-allocation graph, Deadlock Prevention, Deadlock avoidance: RAG & Banker's algorithm for single & multiple resources, Deadlock Detection, Recovery	**06 hours**	**10 %**
7.	**Memory Management** Address binding, Address space, Swapping, Contiguous Memory Allocation Paging, Page table: Hierarchical, Hashed, Inverted Segmentation, Virtual-Memory: Demand Paging, Page Replacement algorithms: FIFO, Optimal, LRU, Second chance, LFU & MFU, Working set model, Thrashing, Frame Allocation	**15 hours**	**25 %**
8.	**File System** File concept, Access methods, Directory & Disk Structure, File protection: Type, access control File System Structure, Implementation, Directory Implementation, Allocation Methods, Free space management,	**06 hours**	**10 %**
9.	**Secondary Storage Structure & I/O systems** Disk: structure, Arm scheduling: FCFS, SSTF, SCAN, LOOK, Formatting & Boot block, RAID Structure & levels I/O Hardware, Interrupt, DMA, Block & Character devices, Network devices, Transforming I/O request to Hardware operations	**06 hours**	**10 %**

10. **System Security** **03 hours** **05 %**
Goals of protection, domain of protection, Trojan Horse, Viruses, Worms

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will able to exhibit familiarity with the fundamental concepts of operating systems
- Students will able to exhibit competence in recognizing operating systems features and issues
- Students will able to apply a mature understanding of operating system designed how it impacts application systems design and performance.

F. Recommended Study Material:

❖ **Text Books:**

1. Operating System Concepts, 9th Edition by AviSilberschatz, Peter Baer Galvin, Greg Gagne, Wiley Publication.

❖ **Reference Books:**

2. Modern Operating Systems, 3rd Edition By Andrew S. Tanenbaum, PHI
3. Operating System – Internals & Design Principles, William Stallings, PHI
4. Operating Systems, D.M.Dhamdhare, TMH
5. Unix System Concepts & Applications, 4E, Sumitabha Das, TMH
6. Unix Shell Programming, YashwantKanitkar, BPB Publications.

IT344: COMPUTER NETWORKS

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Computer Network are:

- To learn the basics of data communications technologies.
- To build knowledge on various OSI and TCP/IP.
- To study the working principles of LAN and its standards.
- To build skills in working with Ethernet Protocols to develop simulated environment.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Computer Networks and the Internet	05
2.	Application Layer	13
3.	Transport Layer	18
4.	The Network Layer	13
5.	The Link Layer: Links, Access Networks, and LANs	07
6.	Network Management	04

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

C. Detailed Syllabus:

1.	**Computer Networks and the Internet**	**05 hours**	**08 %**
1.1	What Is a Protocol?		
1.2	Access Networks		
1.3	Physical Media		
1.4	Packet Switching & Circuit Switching		
1.5	Delay, Loss, and Throughput in Packet-Switched Networks		
2.	**Application Layer**	**13 hours**	**22 %**
2.1	Principles of Network Applications		
2.2	The Web and HTTP		
2.3	File Transfer: FTP		
2.4	SMTP		
3.	**Transport Layer**	**18 hours**	**30 %**
3.1	Introduction and Transport-Layer Services		
3.2	Multiplexing and DE multiplexing		
3.3	Connectionless Transport: UDP		
3.4	Principles of Reliable Data Transfer		
3.5	Connection-Oriented Transport: TCP		
3.6	Principles of Congestion Control		
4.	**The Network Layer**	**13 hours**	**22 %**
4.1	Introduction		
4.2	Virtual Circuit and Datagram Networks		
4.3	What's Inside a Router?		
4.4	The Internet Protocol (IP): Forwarding and Addressing in the Internet		
4.5	Routing Algorithms		
5.	**The Link Layer: Links, Access Networks, and LANs**	**07 hours**	**12 %**
5.1	Introduction to the Link Layer		
5.2	Error-Detection and -Correction Techniques		
5.3	Multiple Access Links and Protocols		
5.4	Switched Local Area Networks		
6	**Network Management**	**04 hours**	**07 %**
6.1	What Is Network Management?		

6.2 The Infrastructure for Network Management

6.3 The Internet-Standard Management Framework

7 Self-Study Topics

Data Centre Networking, Socket Programming with UDP,
Socket Programming with TCP

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will learn the fundamentals of Computer Networking & its applications.
- Students will develop "state of the art application" with the use of theoretical and practical knowledge gained in the semester.

F. Recommended Study Material:

❖ **Text Book**

1. Computer Networking: A Top-Down Approach James F. Kurose, University of Massachusetts, Amherst Keith W. Ross, Polytechnic University, Brooklyn

❖ **Reference Materials:**

1. Computer Networks by Andrew S Tanenbaum.
2. Data Communication And Networking **by** BehrouzForouzan

❖ **Web Materials:**

1. www.ietf.org – For drafts
2. www.ieee.org – For standards and technical research papers
3. http://nptel.iitm.ac.in/courses.php?disciplineId=117

IT345: SOFTWARE GROUP PROJECT - II

Credit and Hours:

Teaching Scheme	Theory	Practical	Project	Total	Credit
Hours/week	0	0	4	4	2
Marks	0	-	100	100	

A. Objective of the Course:

The main objective of the course is:

- To increase awareness and enhance knowledge of students in developing software projects compatible with industry standard, technology and latest development in field of Computer and IT.
- To apply various tools in software development life cycle.

B. Outline of the Course:

Sr. No.	Title	Minimum Number of Hours
1	Software Project Planning and Tracking tools	20
2	Software Designing Tools	20
3	Software Testing Tools	20

Total hours (Theory): 00
Total hours (Lab): 60
Total hours: 60

C. Detailed Syllabus:

1.	**Software Project Planning and Tracking Tools**	**20 Hours**
1.1	Pert Chart, Gantt Chart, MS Project and Visio	
1.2	Primavera for project tracking	
2	**Software Project Designing Tools**	**20 Hours**
2.1	MS Visio, Rational Rose, Edraw Max	
3	**Software Testing Tools**	**20 Hours**
3.1	Win runner, HP Load Runner	

D. Instructional Method and Pedagogy:

1. Project Groups would be form of maximum two students.
2. Inter batch group formation is not permitted due to difficulties in progress tracking.
3. Students are advised to choose innovative and challenging definitions.
4. Batch wise project definitions must be unique.
5. Any management system as project topic would be preferable in this semester.
6. Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
7. Student has to prepare report at end of semester as part of submission.
8. Report structure is finalized for semester end submission.
9. To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
10. To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check (iThenticate/ Turnitin report) before 15 days of external exam.
11. Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
12. Students have to bring internal review card hard copy on the day of internal review exam, after that they will attach filled review card in their final project report.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- At the end of this practical session student will do certain hand on experience on software project phase tools.
- Students will able to apply software project management concepts in software engineering subject.

IT371: ADVANCED JAVA PROGRAMMING (ELECTIVE I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	-	6	4
Marks	100	100	-	200	

A. Objective of the Course:

The main objectives for offering the course Advanced Java Programming are:

- To explain the key components of a J2EE system and understand how they interact.
- To develop an understanding of the various configurations and proper techniques for constructing Servlets, JSP and EJB applications

B. Outline of the Course:

Sr No.	Title of the unit	Minimum Number of Hours
1	RMI Programming	04
2	JDBC SQL Programming	04
3	Java mail API	02
5	Java Security	02
6	Servlet	06
7	JSP	06
8	Java Media Framework	06

Total hours (Theory): 30

Total hours (Lab): 60

Total hours: 90

C. Detailed Syllabus:

1	**RMI Programming**	**04 hours**	**13%**
1.1	Introduction to RMI, Serializable Classes, Remote Classes and Interfaces, Programming a Client, Programming a Server, Starting the Server, Running a Client, Security		
2	**JDBC SQL Programming**	**04 hours**	**13%**
2.1	The JDBC Connectivity Model		
2.2	Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data		
2.3	Error Checking and the SQLException Class, The SQLWarning Class		
2.4	The Statement Interface, The ResultSet Interface, Updatable Result Sets		
2.5	JDBC Types		
2.6	Executing SQL Queries, ResultSetMetaData, Executing SQL Updates, Transaction Management		
3.	**Java mail API**	**02 hours**	**07%**
3.1	JavaMail (Version 1.2), Java Activation Framework (JAF), Send a Simple Email, Send an HTML Email, Send Attachment in Email, Deleting Email, Forwarding Email, JavaMail – GMail via SSL, JavaMail – GMail via TLS		
4.	**Java Security**	**02 hours**	**07%**
4.1	J2EE security concepts, JVM Security		
4.2	Security management, java API security, browser security		
4.3	Web services security classification, security within a web services tier, programmatic security		
5	**Servlet**	**06 hours**	**20%**
5.1	Overview of Servlet Architecture		
5.2	The Servlet Model and HttpServlets, HTTP and Server Programs		
5.3	Handling Exceptions, Session Management, Filters		
6	**JSP**	**06 hours**	**20%**

6.1	Introduction to JSP, Writing JSP Pages, Translation and Compilation, , ,		
6.2	Errors and Exceptions Handling		
6.3	Including and Forwarding from JSP Pages, Expression Language, Custom Actions and Tag Libraries		
6.4	JavaServer Pages Standard Tag Library(JSTL)		
7	**JAVA Media Framework**	**06 hours**	**20%**
7.1	Introduction to Framework		
7.2	3D Graphics		
7.3	Internationalization		
7.4	Case Study: Deploying n-tier Application		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

- Design, create, test, and maintain J2EE components.
- Apply object oriented analysis and design techniques during development of an application.
- Use the various components like Servlets, JSPs, EJBs, involved in developing J2EE applications along with some advanced features like JMS, JNDI, JavaMail API etc.
- Design application based on MVC architecture and its usage.
- Create various xml files used for server configuration, application configuration, etc.
- Package and deploy a J2EE application. Students will have thorough understanding of JAR, WAR and EAR files.

F. Recommended Study Material:

❖ **Text Books:**

1. James Keogh, The Complete Reference,TATA McGraw-Hill.
2. James L. Weaver, Kevin Mukhar, and Jim Crume, Beginning J2EE 1.4: From Novice to Professional, Wrox
3. Bryan Basham, Kathy Sierra, and Bert Bates, Head First Servlets and JSP: Passing the Sun Certified Web Component Developer Exam, O'Reilly Media

❖ **Reference Books:**

4. Kathy Sierra and Bert Bates, Head First EJB, O'Reilly Media
5. Richard Monson-Haefel, J2EE Web Services: XML SOAP WSDL UDDI WS-I JAX-RPC JAXR SAAJ JAXP,Addison-Wesley Professional

❖ **Web Materials:**

1. http://www.service-architecture.com/application-servers/articles/j2ee_web_site_architecture.html
2. http://www.oracle.com/technetwork/java/javaee/overview/index.html
3. http://www.roseindia.net/struts/hibernatespring/index.shtml
4. http://www.roseindia.net/jsf/

IT373: EMBEDDED SYSTEMS (ELECTIVE I)

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	-	6	4
Marks	100	100	-	200	

A. Objective of the Course:

The main objectives for offering the course Embedded Systems are:

- To have a basic proficiency in a traditional embedded C language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
- To have an understanding of the basic issues of embedded software development and associated hardware.
- To have a basic understanding of some of the more advanced topics of embedded systems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum Number of hours
1.	Introduction to Embedded System.	04
2.	Embedded Software.	07
3.	Embedded System Development.	06
4.	Real Time Operating System.	06
5.	Real Time Programming Issues.	05
6.	Case Study of embedded and real-time operating systems, real time applications	02

Total hours (Theory):30

Total hours (Lab): 60

Total hours: 90

C. Detailed Syllabus:

1.	**Introduction to Embedded System.**	**04 hours**	**13%**

1.1 Characteristics of Embedded System.

1.2 Types of Embedded Systems.

1.3 Examples of Embedded Systems.

2.	**Embedded Software.**	**07 hours**	**25%**

2.1 Embedded Programming in C and C++

2.2 Source Code Engineering Tools for Embedded C/C++

2.3 Program Modeling Concepts in Single and Multiprocessor Systems

2.4 Software Development Process

2.5 Software Engineering Practices in the Embedded Software Development

3.	**Embedded System Development.**	**06 hours**	**19%**

3.1 Embedded software development tools – Emulators and debuggers.

3.2 Design issues and techniques

3.3 Case studies

3.4 Complete design of example embedded systems

4.	**Real Time Operating System.**	**06 hours**	**20%**

4.1 Typical OS structure.

4.2 RTOS structure.

4.3 The context of its use.

4.4 Schedule management for multiple tasks.

4.5 Scheduling in real time.

4.6 Interrupt routines in RTOS environment.

4.7 RTOS task scheduling models.

4.8 List of basic actions in pre-emptive scheduler and expected time taken.

5	**Real Time Programming Issues.**	**05 hours**	**17%**

5.1 Real time programming issues during software development process

5.2 Distinction between functions, ISR and tasks.

5.3 Problems of sharing data in RTOS.

5.4 Inter-process communication in RTOS.

5.5 Interrupt servicing mechanism.

5.6 Context and periods for context switching.

5.7 Deadline and Interrupt latency.

6 Case Study of embedded and real-time operating systems, real time applications. 02 hours 06%

6.1 Case study of RTOS using MUCOS.

6.2 Case study for RTOS based programming.

6.3 Coding for Automatic Chocolate vending machine using MUCOS.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

- To solve difficult and complex problem of computer science using Embedded Systems
- To select any R&D field related to application of Embedded Systems in PG courses.
- To develop hardware based solutions to industry problems
- To develop software solution as per need of today's IT edge which requires high automation and less human intervention.

F. Recommended Study Material:

❖ Text Books

1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw-Hill, 2003.
2. WayneWolf, "Computers as Components: Principles of Embedded Computer SystemDesign", Elsevier, 2006.

❖ Reference Books

3. SriramIyer and Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw-Hill, 2004.
4. F. Vahid, T. Givargis, Embedded System Design, John Wiley and Sons, 2002
5. Code generation for Embedded Processors by Peter Marwedel, G. Goosens, KlunerAcademic Pub. 1993.

6. IT374: Python Programming [Elective-I]

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	2	4	-	4	4
Marks	100	100	-	200	

A. Objective of the Course:

This subject introduces python programming language. It emphasizes use of python programming in multiple domains.

The objective of course is,

- To various construct available in python.
- To use python for different domain of Web Development, general purpose programming, Backend development, Scientific Experimentation, artificial Intelligence etc.
- To teach how to take the statement of a problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic.
- To demonstrate how to test and prepare a real time application using python.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Applications of Python Programming	01
2.	Compilers and Editors for python programs	01
3.	Operators , I/O , control structures	06
4.	Basic Data types	04
5.	List and Dictionaries	06
6.	Functions	02
7.	Object and Classes in Python	02
8.	File Handlling	02
9.	Use of Libraries: Numpy, Pandas	06

Total hours (Theory): 30
Total hours (Lab): 60
Total hours: 90

C. Detailed Syllabus:

1.	**Applications of Python Programming** History of Python, Python Features,	**01 hours**	**4 %**
2.	**Python - Environment Setup** Local Environment Setup, Installing Python, Setting up PATH, Python Environment Variables	**01 hours**	**4 %**
3.	**Operators , I/O , control structures** Types of Operator, Input function, If, If..else and nested if.	**06 hours**	**19 %**
4.	**Basic Data types** Inheritance: Using super creating multilevel Hierarchy, method overriding, Dynamic method dispatch, abstract classes, Using final with Inheritance, Using Package: Defining package, Finding package and CLASSPATH, Access protection, Importing package, Interface: Defining Interface, Implementing Interface, Variables in Interface	**04 hours**	**14 %**
5.	**List and Dictionaries** Accessing Values in Lists, Updating Lists, Delete List Elements, Basic List Operations	06 **hours**	**19 %**
6.	**Functions** Introduction to Annotation, Byte streams and character streams, Wrapper classes , Why Lambda Expression, Lambda Expression Syntax, Where to use lambda expression, Adopting Patterns like matching, finding and filtering,	**02 hours**	**07 %**
7.	**Objects and Classes in Python** Overview of OOP Terminology, Creating Classes, Creating Instance Objects, Destroying Objects, Overriding Methods	**2 hours**	**07 %**
8.	**File I/O** Printing to the Screen, Reading Keyboard Input, Reading and Writing Files	**02 hours**	**07 %**
9.	Use of Libraries: Numpy, Pandas	**06 hours**	**19 %**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries a 5% component of the overall evaluation.
- Faculty deals with concept test as it implies focus on one key concept of learning
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation. The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

By taking this course Python Programming,

- Students will be able to apply python in different software application.
- Student will be able to pr epare standalone application; GUI based application as well as multithreaded programming for real life projects using core features of python.
- Students will be able to design and develop projects in higher semesters using Object oriented design approach and python programming language.

F. Recommended Study Material:

❖ **Text Books:**

1. Programming Python: Powerful Object-Oriented Programming Fourth Edition by Mark Lutz
2. The Quick Python Book, Second Edition 2nd Edition by Vernon L. Ced

❖ **Reference Books:**

1. Python Essential Reference (4th Edition) 4th Edition by David Beazley

❖ **Web Materials:**

1. Python.org – Official Python site. Find a complete list of all documentation, installation, tutorials, news etc.
2. Web Programming in Python – This topic guide attempts to cover every aspect of programming Web applications (both clients and servers) using Python.

IT346: SUMMER INTERNSHIP-I

Credit and Hours:

Teaching Scheme	Project	Total	Credit
Hours	90	90	3
Marks	150	150	

A. Objective of the Course:

Summer internships are required to be carried out in order to help students to find and know the applications of their theoretical knowledge enhance their company/industry/organization experience, get familiar with the company/industry/organization culture and work ethics.

The main objectives for offering the internship for the students are:

- To get perspective and experience of the field
- To make students company/industry/organization ready
- To get familiar with modern tools and technologies
- To enhance technical writing skills in reporting as per the company/industry/organization standards
- To get involved in design, development and testing practices followed in the company/industry/organization
- To enhance their soft-skills, presentation skills, interpersonal skills, documentation skills and office etiquettes required to sustain in company/industry/organization environment
- To participate in teamwork and preferably as part of a multi-disciplinary team
- To understand the professional and ethical responsibilities of an engineer
- To make them more productive, consistent and punctual
- To make them aware about company/industry/organization best practices, processes and regulations

B. Instructional Method and Pedagogy:

- Summer internship shall be at least 90 hours during the summer vacation only.
- Department/Institute will help students to find an appropriate company/industry/organization for the summer internship.
- The student must fill up and get approved a Summer Internship Acceptance form by the company and provide it to the Coordinator of the department within the specified deadline.
- Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed.
- During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and those of the University.
- Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later.
- The student shall submit two documents to the Coordinator for the evaluation of the summer internship:
    - Summer Internship Report
    - Summer Internship Assessment Form
- Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted through the presentation to the Coordinator by the first day of the new term.
- The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in this guideline. Each report will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester.
- If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.

C. Format of Summer Internship Report:

The report shall comply with the summer internship program principles. Main headings are to be centered and written in capital boldface letters. Sub-titles shall be written in small letters and boldface. The typeface shall be Times New Roman font with 12pt. All the margins shall be 2.5cm. The report shall be submitted in printed form and filed. An electronic copy of the report shall be recorded in a CD and enclosed in the report. Each report shall be bound in a simple wire vinyl file and contain the following sections:

- Cover Page
- Page of Approval and Grading
- Abstract page: An abstract gives the essence of the report (usually less than one page). Abstract is written after the report is completed. It must contain the purpose and scope of internship, the actual work done in the plant, and conclusions arrived at.
- TABLE OF CONTENTS (with the corresponding page numbers)
- LIST OF FIGURES AND TABLES (with the corresponding page numbers)
- DESCRIPTION OF THE COMPANY/INDUSTRY/ORGANISATION: Summarize the work type, administrative structure, number of employees (how many engineers, under which division, etc.), etc. Provide information regarding
    - Location and spread of the company
    - Number of employees, engineers, technicians, administrators in the company
    - Divisions of the company
    - Your group and division
    - Administrative tree (if available)
    - Main functions of the company
    - Customer profile and market share
- INTRODUCTION: In this section, give the purpose of the summer internship, reasons for choosing the location and company, and general information regarding the nature of work you carried out.
- PROBLEM STATEMENT: What is the problem you are solving, and what are the reasons and causes of this problem.

- SOLUTION: In this section, describe what you did and what you observed during the summer internship. It is very important that majority of what you write should be based on what you did and observed that truly belongs to the company/industry/organization.
- CONCLUSIONS: In the last section, summarize the summer internship activities. Present your observations, contributions and intellectual benefits. If this is your second summer internship, compare the first and second summer internships and your preferences.
- REFERENCES: List any source you have used in the document including books, articles and web sites in a consistent format.
- APPENDICES: If you have supplementary material (not appropriate for the main body of the report), you can place them here. These could be schematics, algorithms, drawings, etc. If the document is a datasheet and it can be easily accessed from the internet, then you can refer to it with the appropriate internet link and document number. In this manner you don't have to print it and waste tons of paper.

D. Learning outcomes:

After completion of the course students, will able:

- To apply knowledge and skills learned in company/industry/organization to real-world problems.
- To solve engineering problems.
- To function in a team work.
- To work with teammates from other disciplines.
- To use experience related to professional and ethical issues in the work environment.
- To explain the impact of engineering solutions developed in a project, in a global, economic, environmental, and societal context.
- To finds relevant sources (e.g., library, Internet, experts) and gather information.
- To demonstrate knowledge of contemporary issues related with engineering in general.
- To use new tools and technologies.

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 6)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT347: SOFTWARE ENGINEERING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Software Engineering are:

- To describe the concepts of Software requirements gathering and analyzing, Software design techniques, implementation guidelines,
- To explain CASE tools, design concepts, automated Software Testing, Documentation and Maintenance.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum Number of Hours
1	Introduction to Software and Software Engineering	07
2	Agile Development	07
3	Managing Software Project	08
4	Requirement Analysis and Specification	07
5	Software Design	07
6	Software Coding &Testing	08
7	Quality Assurance and Management	07
8	Software Maintenance and Configuration Management	06
9	Advanced Topics in Software Engineering	03

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

C. Detailed Syllabus:

1.	**Introduction to Software and Software Engineering**	**07 hours**	**12%**
1.1	The Evolving Role of Software		
1.2	Software: A Crisis on the Horizon and Software Myths		
1.3	Software Engineering: A Layered Technology		
1.4	Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Spiral Model, Agile Process Model		
1.5	Component-Based Development, Process, Product and Process		
2.	**Agile Development**	**07 hours**	**12%**
2.1	Agility and Agile Process model		
2.2	Extreme Programming		
2.3	Other process models of Agile Development and Tools		
3	**Managing Software Project**	**08 hours**	**15%**
3.1	Software Metrics (Process, Product and Project Metrics)		
3.2	Software Project Estimations		
3.3	Software Project Planning (MS Project & Visio Tool)		
3.4	Project Scheduling & Tracking(Earn Value Analysis)		
3.5	Risk Analysis & Management(Risk Identification, Risk Projection, Risk Refinement ,Risk Mitigation)		
4	**Requirement Analysis and Specification**	**07 hours**	**12%**
4.1	Understanding the Requirement		
4.2	Requirement Modeling		
4.3	Requirement Specification (SRS)		
4.4	Requirement Analysis and Requirement Elicitation		
4.5	Requirement Engineering		
5	**Software Design**	**07 hours**	**12%**
5.1	Design Concepts and Design Principal		
5.2	Architectural Design		
5.3	Component Level Design (Function Oriented Design, Object Oriented Design) (MS Visio Tool)		
5.4	User Interface Design		
6.	**Software Coding & Testing**	**08 hours**	**15%**
6.1	Coding Standard and coding Guidelines		

6.2	Code Review		
6.3	Software Documentation		
6.4	Testing Strategies		
6.5	Testing Techniques and Test Case, Test Suites Design		
6.6	Testing Conventional Applications		
6.7	Testing Object Oriented Applications		
6.8	Testing Web and Mobile Applications, Testing Tools (Win runner, Load runner)		
7.	**Quality Assurance and Management**	**07 hours**	**12%**
7.1	Quality Concepts and Software Quality Assurance		
7.2	Software Reviews (Formal Technical Reviews)		
7.3	Software Reliability		
7.4	The Quality Standards: ISO 9000, CMM, Six Sigma for SE.		
7.5	SQA Plan		
8.	**Software Maintenance and Configuration Management**	**06 hours**	**08%**
8.1	Types of Software Maintenance, Re-Engineering, Reverse Engineering, Forward Engineering		
8.1	The SCM Process, Identification of Objects in the Software Configuration		
8.2	Version Control and Change Control		
9.	**Advanced Topics in Software Engineering**	**03 hours**	**02%**
9.1	Component-Based Software Engineering, Client/Server Software Engineering, Web Engineering, Reengineering, Computer-Aided Software Engineering		
9.2	Software Process Improvement		
9.3	Emerging Trends in software Engineering		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.
- Students have to under gone MOOCS Classes by Armando Fox and David Patterson

E. Student Learning Outcome:

After completion of the course students will be able to

- Prepare SRS (Software Requirement Specification) document and SPMP (Software Project Management Plan) document.
- Apply the concept of Functional Oriented and Object Oriented Approach for Software Design.
- Recognize how to ensure the quality of software product, different quality standards and software review techniques.
- Apply various testing techniques and test plan in.
- Able to understand modern Agile Development and Service Oriented Architecture Concept of Industry.

F. Recommended Study Material:

❖ **Text Books:**

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions

❖ **Reference Books:**

2. Engineering Software as a Service An Agile Software Approach,Armando Fox and David Patterson
3. Ian Sommerville, Software engineering, Pearson education Asia
4. PankajJalote, An Integrated Approach to Software Engineering by, Springer
5. Rajib Mall, Fundamentals of software Engineering,Prentice Hall of India.
6. John M Nicolas, Project Management for Business, Engineering and Technology,Elsevier

❖ **Web Materials:**

1. www.en.wikipedia.org/wiki/Software_engineering
2. www.win.tue.nl
3. www.rspa.com/spi
4. www.onesmartclick.com/engsineering/software-engineering.html
5. www.sei.cmu.edus
6. https://www.edx.org/school/uc-berkeleyx

IT348 CRYPTOGRAPHY & NETWORK SECURITY

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Cryptography and Network Security are:

- To introduce cryptography theories, algorithms and systems. Necessary approaches and techniques to build protection mechanisms in order to secure computer networks
- To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hash and digital signature.
- To explore issues surrounding secure key management, random number generation, and the incorporation of cryptography into legacy applications.
- To analyze performance of various cryptographic and cryptanalytic algorithms.

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction and Mathematical Foundations	09
2.	Symmetric Key Ciphers	15
3.	Public Key Cryptography	09
4.	Message Authentication and HashFunction	09
5.	Network Security	12
6.	System Security	06

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

C. Detailed Syllabus:

1.	**Introduction and Mathematical Foundations**	**09 hours**	**15 %**
1.1	Security trends – Attacks, Services and Mechanism		
1.2	Conventional Encryption Model, Classical Encryption Techniques, Different types of ciphers, Steganography		
1.3	Basic Number theory—Prime And Relative Prime Numbers, Modular Arithmetic, Congruence ,Fermat and Euler's theorem, Euclid's Algorithm, Chinese Remainder theorem, LFSR sequences , Finite fields.		
2.	**Symmetric Key Ciphers**	**15 hours**	**25 %**
2.1	Simplified Data Encryption Standard, DES, Triple DES		
2.2	Block Cipher Principles,Characteristics Of Advanced Symmetric Block Cipher, Differential And Linear cryptanalysis, Block Cipher Design Principles		
2.3	Advanced Encryption Standard Algorithm,RC4 and RC5		
2.4	Modes of Operation		
2.5	Pseudorandom Number generator and function, Key Distribution		
3.	**Public Key Cryptography**	**09 hours**	**15%**
3.1	Principles Of Public-Key Cryptography		
3.2	RSA Algorithm		
3.3	Key Management		
3.4	ElGamal Algorithm		
3.5	Diffie-Hellman Key Exchange		
4.	**Message Authentication and Hash Function**	**09 hours**	**15 %**
4.1	Authentication Requirement		
4.2	Hash Functions ,Message Authentication Code, Security Of Hash Functions And MAC		
4.3	MD5 Message Digest Algorithm, Secure Hash Algorithm, HMAC		
4.4	Authentication protocols ,Digital Signatures, DSS,		
5.	**Network Security**	**12 hours**	**20%**

5.1	Authentication Applications—Kerberos, X.509 Directory Authentication Service,		
5.2	Electronic Mail Security—PGP ,S/MIME		
5.3	IP security —Overview, ESP, AH, Transport and Tunnel mode in IP Sec		
5.4	Web Security— Web Security Requirement, SSL, TLS,SET		
6.	**System Security**	**06 hours**	**10%**
6.1	Intruders, Viruses and Related Threats		
6.2	Firewall Design Principles		
6.3	Trusted Systems		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

After completion of the course students will be able to

- Know the importance of security and to apply the concepts of techniques and methods to implement security mechanism.

- Implements the aspects of integrity and authentication, like digital signature and message digest, and map them with practical use of it.
- Come up with new techniques and methods which can be considered as algorithm of cryptography and eventually can be deployed as independent technique.
- Apply the technique to make legacy system more secure by adapting latest methods.

E. Recommended Study Material:

❖ **Text Books:**

1. William Stallings, Cryptography And Network Principles And Practice,Prentice Hall, Pearson Education Asia

❖ **Reference Books:**

1. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Companies
2. AtulKahate, Cryptography & Network Security, The McGraw-Hill Companies
3. William Stallings Network Security Essentials: Applications And Standards, Prentice Hall, Pearson Education

❖ **Reference Links/ e-content:**

1. http://people.csail.mit.edu/rivest/crypto-security.html
2. http://www.cryptix.org/
3. http://www.cryptocd.org/
4. http://www.cryptopp.com/

IT349: WIRELESS COMMUNICATION & MOBILE COMPUTING

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	4	-	8	6
Marks	100	100	-	200	

A. Objective of the Course:

The main objectives for offering the course Wireless Communication & Mobile Computing are:

- To learn the basics of Wireless voice and data communications technologies.
- To build knowledge on various Mobile Computing algorithms.
- To study the working principles of wireless LAN and its standards.
- To build skills in working with Wireless application Protocols to develop mobile content applications.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Wireless Communication Fundamentals	06
2.	Telecommunication Network	13
3.	Wireless LAN	18
4.	Mobile Network Layer	13
5.	Transport and Application Layer	10

Total hours (Theory): 60

Total hours (Lab): 60

Total hours: 120

C. Detailed Syllabus:

1.	**Wireless Communication Fundamentals**	**06 hours**	**10 %**
1.1	Introduction		
1.2	Wireless transmission – Frequencies for radio transmission – Signals – Antennas – Signal Propagation		
1.3	Multiplexing – Modulations – Spread spectrum		
1.4	MAC – SDMA – FDMA – TDMA – CDMA – Cellular Wireless Networks		
2.	**Telecommunication Network**	**13 hours**	**25 %**
2.1	Telecommunication systems Overview – GSM – GPRS – DECT – UMTS – Satellite Networks		
2.2	GSM		
2.3	GPRS		
2.4	CDMA		
3.	**Wireless LAN**	**18 hours**	**30 %**
3.1	Wireless LAN – IEEE 802.11 - Architecture – services – MAC – Physical layer		
3.2	IEEE 802.11a - 802.11b – 802.11n standards		
3.3	Bluetooth		
3.4	Hyperlan, Wi-Fi, WiMax - Overview		
4.	**Mobile Network Layer**	**13 hours**	**20 %**
4.1	Mobile IP		
4.2	Dynamic Host Configuration Protocol		
4.3	Routing Protocols – DSDV – DSR – Alternative Metrics.		
5.	**Transport and Application Layer**	**10 hours**	**12 %**
5.1	Traditional TCP		
5.2	Classical TCP improvements – WAP, WAP 2.0		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will learn the fundamentals of Wireless communication and WLAN standards.
- Students will develop "state of the art application" with the use of theoretical and practical knowledge gained in the semester.

F. Recommended Study Material:

❖ **Text Books:**

1. "Mobile Computing: Technology, Applications and Service Creation" by Asoke K Talukder and Roopa R Yavagal, TMH,ISBM: 0-07-058807-4

❖ **Reference Materials:**

2. Jochen Schiller, "Mobile Communications", PHI/Pearson Education, Second Edition, 2003.

3. William Stallings, "Wireless Communications and Networks", PHI/Pearson Education, 2002.
4. KavehPahlavan, PrasanthKrishnamoorthy, "Principles of Wireless Networks", PHI/Pearson Education, 2003.
5. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
6. Hazysztof Wesolowshi, "Mobile CommunicationSystems", John Wiley and Sons Ltd, 2002
7. Research papers from IEEE, Springer etc.

❖ **Web links:**

1. www.ietf.org – For drafts
2. www.ieee.org – For standards and technical research papers

IT375: SERVICE ORIENTED ARCHITECTURE [ELECTIVE-II]

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

- The primary objective of this subject to close the gap between the high-level concept of Service-Oriented Architecture
- Gain a comprehensive understanding of the philosophy and architecture of Web services and Service Oriented Architecture
- Understand the principle of Web services security and implement authentication on both the server and client

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Roots of SOA	12
2.	Web service Basics	12
3.	Service Oriented Analysis	12
4.	SOA Platform Basics	12
5.	WS-BPEL basics	12

Total hours (Theory): 60 Hrs.

Total hours (Lab): 30Hrs.

Total hours: 90Hrs.

C. Detailed Syllabus:

1. **Roots of SOA** **12Hrs** **20%**

   Introduction, Comparing SOA to different architecture, Anatomy of SOA How Components in SOA interrelate, Principles of SOA.

2. **Web Service Basics** **12Hrs** **20%**

Service Description, Messaging with SOAP, Message Exchange pattern, Coordination, Transaction, Business Activities, Orchestration, Choreography, Task centric business service design.

3. **Service Oriented Analysis** **12Hrs** **20%**

Business centric SOA, WSDL Basics, SOAP Basics, Service Layer Abstraction Application Server Design.

4. **SOA Platform Basics** **12Hrs** **20%**

SOA supports in J2EE, Java API for XML based web service (JAX-WS) Java architecture for XML Registries (JAXR), JAX-RPC, SOA supports in .NET, ASP.NET web service, Web service Enhancement (WSE)

5. **WS-BPEL** **12Hrs** **20%**

Introduction, WS-Coordination overview, WS-Choreography WS-Policy, WS-Security.

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Faculty would use **coached** problem solving method as it is class format in which faculty provide a structured, guided context for students working collaboratively to solve problems.
- Attendance is compulsory in lectures and laboratory which carries 5% component of the overall evaluation.
- Minimum two internal exams will be conducted and average of two will be considered as a part of 15% overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weight age of 5%.
- Surprise tests/Quizzes will be conducted which carries 5% component of the overall evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum 10 experiments are suggested in the laboratory related to course content.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Dissect the unique characteristics of web services; be able to distinguish web services from web-based applications and other middleware technologies
- Demonstrate an in-depth knowledge of key standards and platforms that enable the realization of web services, including SOAP, WSDL, UDDI and XML
- Articulate the architectural principles of SOA; be able to demonstrate and critically appraise the role of SOA within the framework of business process management and enterprise system integration
- Deploy, use, and publish web services based on SOA principles and service oriented development methodology

F. Recommended Study Material:

❖ **Text Books:**

1. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education
2. Mark D. Hansen, SOA Using Java™ Web Services

❖ **Reference Books:**

3. Thomas Erl, "Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education.
4. Service-Oriented Computing: Semantics, Processes, Agents, Munindar P. Singh and Michael N Huhns, John Wiley & Sons, Ltd., 2005
5. Newcomer, Lomow, "Understanding SOA with Web Services", Pearson Education.
6. SandeepChatterjee, James Webber, "Developing Enterprise Web Services, An Architect's Guide", Pearson Education.
7. Dan Woods and Thomas Mattern, "Enterprise SOA Designing IT for Business Innovation" O'REILL

IT 376: Image Processing [ELECTIVE-II]

Credit Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	0	6	5
Marks	100	50	-	150	

A. Objective of the Course:

To study

- Image fundamentals and Formation of Digital Images
- Technique for Image Enhancement in Spatial Domain and Frequency Domain
- Image Restoration Operations and Procedures
- Multimedia Presentation and Format
- Compression in Text, Image and Video

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of Hours
1.	Digital Image Fundamentals	06
2.	Spatial Domain Image Enhancement Techniques	12
3.	Frequency Domain Image Enhancement Techniques	12
4.	Image Restoration Operations	12
5.	Text Compression	14
6.	Image, Video Compression	04

Total hours (Theory): 60 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 90 Hrs.

C. **Detailed Syllabus:**

1.	**Digital Image Fundamentals** Image Basics - Elements of visual perception – Human Eye Structure-Why digital images -The digital camera- Data types and 2D representation of digital images- Application fields of Image Processing- Image Acquisition Techniques-Single Sensor-Strip-Array Sensor - Image sampling and quantization - Discrete sampling model Quantization -Noise processes-Spatial & Gray level resolution- Image attributes- Image Types- Basic relationship between pixels-Neighborhood- Adjacency- Distance measures, Color fundamentals , Color Models, HIS,YIQ,RGB,CMYK,CIE Lab, XYZ, Intensity Slicing, Gray level to Color Transform	**06Hrs**	**10%**
2.	**Spatial Domain Image Enhancement Techniques** Intensity based transforms- Power Law, Log ,Image Negative, Histogram based transforms- Histogram processing, Equalization, Local Enhancement, Specification, Image Averaging, Subtraction, AND-OR-NOT Operations between images, Smoothing Filters- Linear Filters, Order Statistic Filters, Sharpening Filters-Laplacian Filter , Unsharp masking , high boost filtering	**12 Hrs**	**20%**
3.	**Frequency Domain Image Enhancement Techniques** Introduction to signal-frequency concept, Discrete Fourier Transform and Inverse Transform, properties of Fourier Transform ,1D Fourier Transform, 2D Fourier Transform, Frequency Filtering Concepts, Smoothing Filters(Low pass Filters)- Ideal low-pass, Butterworth low-pass, Gaussian low-pass filters, Sharpening Filters(High-Pass filters)- Ideal , Butterworth, Gaussian, Laplacian Filter in Frequency domain, Unsharp masking , high boost filtering ,Homomorphic	**12 Hrs**	**20%**

	Filtering , Convolution & Correlation Theorem , Fast Fourier Transform		
4.	**Image Restoration** Image Degradation-Restoration Model, Noise Models, Noise probability density functions, Noise estimation parameters, Spatial Domain Restoration- Mean filters – Arithmetic mean, Geometric mean, Harmonic mean Order Statistics Filters-Median filter, Max & min filter, Midpoint filter, Alpha trimmed filter, Adaptive filters, Adaptive local noise filter, Adaptive median filter, Frequency Domain Restoration Techniques- Band reject filter, Band-pass filter, Notch filter, Optimum Notch filter, Estimation of Degradation function-By experiment, By Modeling , Inverse Filtering, Wiener Filtering, Constrained Least Square Filtering, Geometric Mean filter	**12 Hrs**	**20%**
5.	**Text Compression** Fundamental to Data Compression, Compression Techniques: Loss less VsLossy Compression, Measures of Performance Parameters for Data Compression, Modeling and Coding of Data, Models: Physical Models, Probability Models, Markov Models, Composite Source Models, Coding: Uniquely Decodable Codes, Prefix Codes, Shannon Fano Algorithm, The Huffman coding algorithm, Minimum variance Huffman codes, Adaptive Huffman coding Update procedure, Encoding procedure Decoding procedure, Golomb codes, Rice codes, Tunstall codes, Statistical Coding: Arithmetic Coding, Coding A Sequence, Generating A Binary Code-Decoding Of Tag-Checking Uniquely Decode Tag, LZW Algorithm.	**14Hrs**	**23%**
6.	**Image,Video Compression**	**04Hrs**	**07%**

Image Basics, DiscretecosineTransform,JPEG Compression -Quantization-Zigzag sequence-EntropyEncoding, MPEG -I - B - P frames.

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

By taking this course Digital Image Processing:

- Understand the basic concepts image processing.
- Image Restoration & Enhancement techniques.
- Image Analysis and Processing
- JPEG, MPEG
- Data Compression : Lossy & Lossless Techniques

F. Recommended Study Material:

❖ **Text Books:**

1. "Digital Image Processing", Rafael C Gonzalez, Richard E Woods, 2nd Edition, Pearson Education 2003.
2. Fundamentals of Multimedia, Ze-Nian Li and Mark S. Drew, 2nd Edition, Prentice-Hall, 2004.
3. Introduction to Data Compression, Khalid Sayood, 3rd Edition, Morgan Kaufmann Publishers, 2006.

❖ **Reference Books:**

4. Fundamentals of Digital Image Processing, A.K. Jain, PHI, New Delhi (1995).
5. Digital Image Processing Using MATLAB,Gonzalez/Woods/Eddins , McGrawhill Publication 2nd edition
6. Data Compression, Mark Nelson and Jean-loupGailly, 2nd Edition, M&T Books, 1995.

❖ **Reference Links/ e-content:**

1. http://www.imageprocessingplace.com/
2. https://sites.google.com/a/charusat.ac.in/pnp/

IT377: MACHINE LEARNING & APPLICATIONS [ELECTIVE-II]

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	4	2	-	6	5
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Artificial Intelligence are:

- To learn about the most effective machine learning techniques, and gain practice implementing them
- To able to effectively use the common neural network "tricks", including initialization, dropout regularization, Batch normalization, gradient checking,
- To understand industry best-practices for building deep learning applications.
- To learn how to quickly and powerfully apply these techniques to new problems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Machine Learning	08
2.	Supervised Learning	16
3.	Neural Networks and Deep Learning	12
4.	Unsupervised Learning	10
5	Model Evaluations	06
6.	Applications and Case Study	08

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 90

C. Detailed Syllabus:

1. **Introduction to Machine Learning**

   Need for Machine Learning, Basic principles, Applications, Challenges, Types of Machine Leaning: Supervised Learning, Unsupervised Learning, Reinforcement Learning — **08 Hours** **13 %**

2.	**Supervised Learning** Linear Regression, Logistic Regression, K Nearest Neighbours, Overfitting and Regularization, Support Vector Machines.	**16 Hours**	**27 %**
3.	**Neural Networks and Deep Learning** Perceptron Learning, Network Overview, Neural Network Representation, Need for Non-Linear Activation Functions, Cost Function, Back propagation, Training & Validation, Need for Deep representations, Building blocks of Deep Neural Networks, CNN	**12 Hours**	**20 %**
4.	**Model Evaluations** Training Testing sets, Learning Curves, Confusion Matrix, Gain and Lift Chart, Root Mean Squared Error, Cross Validation, ROC curves	**10 Hours**	**17%**
5.	**Unsupervised Learning** K-Means Clustering, Hierarchical Clustering, Association Rule Learning, Dimensionality Reduction (PCA, SVD)	**06 Hours**	**10%**
6.	**Applications and Case Study** Machine Learning Applications Across Industries (Healthcare, Retail, Financial Services, Manufacturing, Hospitality) ML offerings AI Startups (Tips, Tricks, Definitions)	**08 Hours**	**13%**

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.

- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.

- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.

- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

- To solve difficult and complex problem of computer science using AI techniques.
- To select any R&D field related to application of AI.
- To understand soft computing and machine learning courses.
- To develop software solution as per need of today's IT edge which requires high automation and less human intervention.
- To demonstrate working knowledge in Python in order to write and explore more sophisticated Python programs
- To apply knowledge representation, reasoning, and machine learning techniques to real-world problems

F. Recommended Study Material:

❖ **Text Books:**

1. Machine Learning, Tom Mitchell, McGraw Hill, 1997. ISBN 0070428077
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004

❖ **Reference Books:**

3. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
4. Richard O. Duda, Peter E. Hart & David G. Stork, "Pattern Classification. Second Edition", Wiley & Sons, 2001.
5. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The elements of statistical learning", Springer, 2001.

6. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", MIT Press, 1998.

❖ **Web Materials:**

1. https://www.youtube.com/watch?v=fgtUFzxNztA
2. http://nptel.iitm.ac.in/video.php?courseId=1041
3. http://www-formal.stanford.edu/jmc/whatisai/whatisai.html
4. http://www.webopedia.com/TERM/A/artificial_intelligence.html
5. http://en.wikipedia.org/wiki/Artificial_intelligence

IT350: SOFTWARE GROUP PROJECT - III

Credit and Hours:

Teaching Scheme	Theory	Practical	Project	Total	Credit
Hours/week	0	-	4	4	2
Marks	0	-	100	100	

A. Objective of the Course:

The main objective of the course is:

- To increase awareness and enhance knowledge of students in developing software projects compatible with industry standard, technology and latest development in field of Computer and IT.
- To apply various tools in software development life cycle.

B. Outline of the Course:

Sr. No.	Title	Minimum Number of Hours
1	Software Project Planning and Tracking tools	20
2	Software Designing Tools	20
3	Software Testing Tools	20

Total hours (Theory): 00
Total hours (Lab): 60
Total hours: 60

C. Detailed Syllabus:

1. Software Project Planning and Tracking Tools **20 Hours**

1.1 Pert Chart, Gantt Chart, MS Project and Visio

1.2 Primavera for project tracking

2 Software Project Designing Tools **20 Hours**

2.1 MS Visio, Rational Rose, Edraw Max

3 Software Testing Tools **20 Hours**

3.1 Win runner, HP Load Runner

D. Instructional Method and Pedagogy:

- Project Groups would be form of maximum two students.
- Inter batch group formation is not permitted due to difficulties in progress tracking.
- Students are advised to choose innovative and challenging definitions.
- Batch wise project definitions must be unique.
- Project based on Web development, E-commerce etc. are restricted. As they would be covered as part of curriculum in other courses.
- Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
- Student has to prepare report at end of semester as part of submission.
- Report structure is finalized for semester end submission.
- To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.
- To maintain similarity below 40%, Students have to submit project's final document to concern SGP guide for plagiarism check (iThenticate/ Turnitin report) before 15 days of external exam.
- Students have to attach plagiarism report in final spiral bound with duly signed by SGP guide.
- Students have to bring internal review card hard copy on the day of internal review exam, after that they will attach filled review card in their final project report.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- At the end of this practical session student will do certain hand on experience on software project phase tools.
- Students will able to apply software project management concepts in software engineering subject.

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 7)

CHAROTARUNIVERSITY OF SCIENCE AND TECHNOLOGY

IT441: DATA SCIENCE

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. An objective of the Course:

The main objectives for offering the course Data Science are:

- To introduce students to basic applications, concepts, and techniques of data Warehousing & mining
- Understand the fundamental processes, concepts and techniques of data mining and develop an appreciation for the inherent complexity of the data-mining task.
- To develop skills for using recent data mining software to solve practical problems in a variety of disciplines.
- To gain experience doing independent study and research.

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B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction	06
2.	Data Pre-processing	12
3.	Data Warehouse & OLAP Technology	10
4.	Data Visualization	08
5.	Decision Tree & Random Forest	05
6.	Application of Data Science in Real World	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction**	**06 hours**	**13.33 %**
1.1	Defining data science, Defining data science by its key components		
1.2	Exploring Data Engineering Pipelines and Infrastructure - Defining big data, Looking at some sources of big data, Distinguishing between data science and data engineering,		
1.3	Boiling Down Data with MapReduce and Hadoop, Identifying Alternative Big Data Solutions		
1.4	Seeing the benefits of business-centric data science, Incorporating Data-Driven Insights into the Business Process		
1.5	Distinguishing Business Intelligence and Data Science, Exploring Data Science in Business		
2.	**Data Pre-processing**	**12 hours**	**20 %**
2.1	Importance of Pre-processing the Data		
2.2	Data Cleaning		
2.3	Data Integration and Transformation		
2.4	Data Reduction		
2.5	Data Discretization and Concept Hierarchy Generation		
3.	**Data Warehouse and OLAP Technology**	**10 hours**	**16.64 %**
3.1	Introduction to Data Warehouse		
3.2	A Multidimensional Data Model		
3.3	Data Warehouse Architecture		
3.4	From Data Warehousing to Data Mining		
4.	**Data Visualization**	**08 hours**	**16.64 %**
4.1	Perfect type of data visualization		
4.2	Picking the right design style		
5.	**Decision Tree & Random Forest**	**05 hours**	**23.33 %**
5.1	Other Classification Methods		
5.2	Prediction		

5.3	Evaluating the Accuracy of a Classifier		
6.	**Application of Data Science in Real World**	04 hours	10.06 %
6.1	Application of data science in the field of Telecommunication		
6.2	Application of data science in the field of Energy		
6.3	Application of data science in the field of government		
6.4	Application of data science in the field of healthcare		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, blackboard, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and an average of the same will be converted to the equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Students will able to understand important of data mining and its various concepts like data preprocessing, various classification algorithms etc.
- A student will be able to develop a reasonably sophisticated data mining application.

- A student is able to select methods and techniques appropriate for the task
- A student is able to develop the methods and tools for the given task

F. Recommended Study Material:

❖ **Text Books:**

1. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
2. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.

❖ **Reference Books:**

3. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
4. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
5. Pieter Adriaans, Dolf Zantinge, "Data Mining", Pearson Education Asia

❖ **Web Links:**

1. http://www.dataminingblog.com
2. http://www.kdnuggest.com

IT442: ADVANCED COMPUTING

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Advanced Computing are:

- To provide an overview of the basic concepts of cluster computing, grid computing and cloud computing.
- To highlight the advantage of deploying cluster computing and cloud computing.
- To illustrate the practical adoption of a cloud and cluster deployment through real life case studies.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Fundamentals of Distributed Computing	06
2.	Understanding Cloud Computing Concepts	06
3.	Cloud Enabling Technologies	05
4.	Cloud Services Providers	04
5.	Understanding and Implementing Cloud Securities	04
6.	Cloud Computing : Cost Metrics ,QoS and SLA	04
8.	Fundamentals of Container Technology & Tools	08
9.	Fundamentals of Micro services and Automation Tools	08

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Fundamentals Distributed Computing**	**06 hours**	**14 %**
1.1	History of Computing , Elements of Distributed Computing, Parallel Computing		
1.2	Scalable Parallel Computer Architecture, Symmetric Multi-Processor		
1.3	Cluster Computing , Architecture and Applications		
1.4	Load Balancing in Cluster Computing.		
1.5	Resource Management and Scheduling in Cluster Computing		
1.6	Programming Environments and Tools : Cluster Computing		
1.7	Setting up the Cluster , Monitor & security		
1.8	Implementing RPC and Web-services		
1.9	Grid Computing and Architecture		
2.	**Understanding Cloud Computing Concepts**	**06 hours**	**14 %**
2.1	History of cloud computing,		
2.2	Technology Innovations: Clustering, Grid ,Utility & Virtualization		
2.3	Cloud characteristics		
2.4	Cloud delivery Models & Deployment Models		
2.5	Cloud Storage , Virtual Private Cloud		
2.6	Challenges of Cloud Computing		
3.	**Cloud Enabling Technologies**	**05 hours**	**12 %**
3.1	Data Center Technology		
3.2	Virtualization Technology		
3.3	Case Study of Cloud Enabling Technologies		
4.	**Cloud Services Providers**	**04 hours**	**10 %**
4.1	Deploying and Accessing cloud services		
4.2	Securing Cloud Services		
4.3	Comparing Cloud Service Providers		
4.4	Amazon Web services, Google Cloud Platform ,		
4.5	Microsoft Azure, Salesforce etc.		
5.	**Understanding and Implementing Cloud Securities**	**04 hours**	**10 %**

5.1	Basic Terms: Confidentiality , Integrity, authenticity, Availability, Risk, Threat		
5.2	Cloud Security Threats		
5.3	Cloud Security Mechanisms		
5.4	Case Studies: AWS (Cloud Security)		
6.	**Cloud Computing : Cost Metrics ,QoS and SLA**	**04 hours**	**08%**
6.1	Cost Metrics : Network, Computing , Storage		
6.2	QoS(Quality of Service) and QoS Metrics , SLA (Service Level Agreement)		
7.	**Fundamentals of Container Technology & Tools**	**08 hours**	**16 %**
7.1	Understanding Basic Terms : Cgroups, Namespace, Layered File System etc.		
7.2	Understanding & Implementing Container.		
7.3	Virtual Machine vs Containers		
7.4	Pros and Cons of Container Technology		
7.5	Fundamentals of Docker.		
7.6	Docker networking and storage		
7.7	Docker Compose		
7.8	Introduction to Container Orchestration and Tool: Kubernets		
8.	**Fundamentals of Micro services and Automation Tools**	**08 hours**	**16 %**
8.1	Introduction to Micro Services and need of Micro Services		
8.2	Micro Services Architecture and Concepts/Components		
8.3	Pros and Cons/Challenges and Applications of Micro Services		
8.4	Introduction to DevOps and CI/CD		
8.5	Introduction to Ansible : Infrastructure/Platform Automation		
8.6	Introduction to Jenkins : CI/CD Automation		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Understand and explain the concept of Grid, Cluster and Cloud Computing.
- Prepare for any upcoming deployments of Grid or Cluster and be able to get started with a potentially available Grid or Cluster setup.

F. Recommended Study Material:

❖ **Text Books:**

1. Erl, Thomas, Ricardo Puttini, and Zaigham Mahmood. Cloud computing: concepts, technology & architecture. Pearson Education, 2013.
2. JUDITH, S. HURWITZ. CLOUD COMPUTING FOR DUMMIES. JOHN WILEY & Sons, 2019.
3. Mastering Cloud Computing. Rajkumar Buya.

❖ **Reference Books:**

4. Ronald Krutz, Cloud Security, Wiley India.
5. Bernard Golden, Virualization for Dummies, Wiley India.

❖ **Web Materials:**

1. www.redbooks.ibm.com/redbooks/pdfs/sg246778.pdf

IT 443: LANGUAGE PROCESSOR

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	4	2	6	**5**
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Language Processor are:

- To study Language processor and language processing activities.
- To explore design and implement lexical analyzer and parser.
- To explore, design code generation schemes.
- To explore optimization of codes.
- To learn the assembly language processing

B. Outline of the Course:

Sr No.	Title of the unit	Minimum number of hours
1.	Introduction to Language Processor	04
2.	Macros and Macro Preprocessors	04
3.	Finite Automata and Grammar	14
4.	Analysis Phase of Compiler	20
5.	Synthesis Phase of Compiler	10
6.	Assemblers	08

Total hours (Theory): 60 Hrs.

Total hours (Lab): 30 Hrs.

Total hours: 90 Hrs.

C. Detailed Syllabus:

1.	**Introduction to Language Processor**	**04 hours**	**05 %**
1.1	Introduction		
1.2	Language processing activities		
1.3	Fundamental of language processing		
1.4	Fundamental of language Specification		
1.5	Introduction to preprocessor, compiler and assembler		
2.	**Macros and Macro Preprocessors**	**04 hours**	**05 %**
2.1	Macro definition and call		
2.2	Macro Expansion, Nested Macro Calls		
2.3	Design of macro preprocessor		
3.	**Finite Automata and Grammar**	**14 Hours**	**25 %**
3.1	Basic Definition, Regular Expression, Regular Language, Finite Automata : NFA and DFA		
3.2	Non Determinism Finite Automata, Conversion from NFA to DFA		
3.3	∧- Non Determinism Finite Automata, Conversion of NFA-∧ to NFA		
3.4	Minimization of DFA		
3.5	Introduction to Grammar, Types of Grammars		
3.6	Context Free Grammars, Derivations and Languages, Relationship between derivation and derivation trees		
3.7	Ambiguity Unambiguous CFG and Algebraic Expressions Bacos Naur Form (BNF), Normal Form – CNF, GNF		
4.	**Analysis Phase of Compiler**	**20 hours**	**40 %**
4.1	Introduction to Lexical analysis, Role of the lexical analyzer		
4.2	Specification of tokens, Recognition of tokens		
4.3	Lexical analyzer generators		
4.4	Role of the parser		
4.5	Top-down parsing, Bottom- up parsing		
4.6	Syntax-Directed Definitions		

4.7	Bottom-Up Evaluation of S-Attributed Definitions and L-Attributed Definitions		
4.8	Top Down Translation and Bottom-Up Evaluation of Inherited Attributes		
5.	**Synthesis Phase of Compiler**	**10 hours**	**15 %**
5.1	Intermediate Languages, Declarations, Assignment Statements, Intermediate code generation techniques		
5.2	The Principal Sources of Optimization		
5.3	Machine Independent and machine dependent code optimization techniques		
5.4	Issues in the Design of a Code Generator		
6.	**Assemblers**	**08 hours**	**10 %**
6.1	Elements of assembly language programming		
6.2	Overview of the assembly process		
6.3	A simple Assembly Scheme		
6.4	Design of two pass assembler		

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- Assignments based on above course content will be given to the students at the end of each chapter. Each assignment contains minimum 5 questions.
- Quizzes and Surprise tests will be conducted for testing the knowledge of students for particular topic.

E. Student Learning Outcome:

By taking this course Language Processor,

- Students will be able to analyze preprocessing activity of the program.
- Students will be able to simulate Compilation process using tools such as LEX and YACC tool.
- Students will be able to analyze and generate the different parsing techniques.
- Students will be able to perform optimization at different level of program.
- Students will be able to perform assembly language process.

F. Recommended Study Material:

❖ **Text Books:**

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia.
2. D. M. Dhamdhere, "System Programming and Operating Systems", Tata McGraw-Hill.
3. John c martin, "Introduction to Languages and the Theory of Computation", The McGraw -Hill.

6. **Reference Books:**

4. Allen I. Holub "Compiler Design in C", Prentice Hall of India.
5. C. N. Fischer and R. J. LeBlanc, "Crafting a compiler with C", Benjamin Cummings.
6. J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill
7. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI.
8. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning.
9. Compiler Construction by Kenneth. C. Louden, Vikas Pub.

7. **Web Materials:**

1. http://compilers.iecc.com/crenshaw
2. http://www.compilerconnection.com
3. http://dinosaur.compilertools.net
4. http://pltplp.net/lex-yacc

IT444: INTERNET OF THINGS

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objectives for offering the course Internet of Things (IoT) are:

- Have built a couple of applications that will communicate with IoT hardware and software
- Have researched a specific IoT domain and provided insight on current work
- Be able to explain how IoT, cloud computing and big data analytics can work together
- Be able to evaluate an IoT offering in terms of IoT levels and Protocols

B. Outline of the Course:

Sr No.	Title of the unit	Minimum Number of Hours
1.	Introduction of IoT	05
2.	IoT Architecture and Protocols	12
3.	Enabling Technologies	10
4.	Emerging Challenges	10
5.	Opportunities for the Developing World	06
6.	IoT Tools and Data Analytics	02

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 95

C. Detailed Syllabus:

1.	**Introduction of IoT**	**05 Hours**	**11 %**
1.1	Introduction		
1.2	Towards ubiquity		
1.3	A question of vision		
1.4	Why the Internet of Things is important		
1.5	M2M Vs. IoT		
2.	**IoT Architecture and Protocols**	**12 Hours**	**27%**
2.1	IoT Protocols, Network Layers of IoT Architecture		
2.2	IoT Threats, Security in IoT/M2M, Privacy		
2.3	Proposed IoT/M2M Security Framework		
3.	**Enabling Technologies**	**10 Hours**	**22 %**
3.1	Introduction		
3.2	Tagging things: RFID		
3.3	Feeling things: Sensor technologies, Thinking things: Smart technologies, Shrinking things: Nanotechnology		
4.	**Emerging Challenges**	**10 Hours**	**22 %**
4.1	Introduction		
4.2	Standardization and harmonization		
4.3	Privacy implications		
4.4	Socio-ethical considerations		
5.	**Opportunities for the Developing World**	**06 Hours**	**13 %**
5.1	Introduction		
5.2	Developing economies as users and innovators		
5.3	Space for the state in enabling the Internet of Things		
5.4	Common development goals and the World Summit on the Information Society		
6.	**IoT Tools and Data Analytics**	**02 Hours**	**05 %**
6.1	Tools in IoT, Data Analytics in IoT, IoT Physical Systems		

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able to do the following:

- Understand the basic concepts Internet of Things
- Integration of Existing technology for development of IoT Applications
- Student will be able to make program which works on Sensors

F. Recommended Study Material:

❖ **Text Books:**

1. "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", Ovidiu Vermesan, Peter Friess, River Publishers.

❖ **Reference Books:**

2. Internet of Things: A hands on approach by Arhdeep Bahga and Vijay Madisetti.
3. Research papers from IEEE, Springer etc.
4. The Internet of Things-ITU.

❖ **Web Materials:**

1. http://www.vs.inf.ethz.ch/res/show.html?what=iot_ – For Research Papers
2. www.ieee.org – For standards and technical research papers

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objective of the Course:

The main objective to give the course

- Discuss the motivation for the typical network hierarchy of access networks, distribution networks, and core networks.
- Understand the differences between the five generations of cellular networks.
- Present an overview of the major categories of packet traffic on the internet including elastic, inelastic and real-time traffic.
- Explain the concept of QoS and QoE.
- Understand the essential elements of routing.
- List and explain the key requirements for and SDN architecture.
- Explain the significance of northbound and southbound APIs.
- Understand the concepts of an OpenFlow logical network device.
- Understand the concept of flowtable.
- Discuss the routing function in the SDN controller.
- Understand importance of SDN application plane.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Elements of Modern Networking	07
2	Requirements and Technology	**10**
3	SDN: Background and Motivation	**10**
4	SDN Data Plane and OpenFlow	**05**
5	SDN Control Plane & SDN Application Plane	**13**

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	Elements of Modern Networking	**07 Hours**	**16%**

The Networking Ecosystem, Example Network Architectures, Ethernet, Wi-Fi, 4G/5G Cellular, Network Convergence, Unified Communications

2.	Requirements and Technology	**10 Hours**	**22%**

Types of Network and Internet Traffic, Demand: Big Data, Cloud Computing, and Mobile Traffic, Requirements: QoS and QoE, Routing, Congestion Control, SDN and NFV, Modern Networking Elements

3.	SDN: Background and Motivation	**10 Hours**	**22%**

Evolving Network Requirements, The SDN Approach, SDN- and NFV-Related Standards

4.	SDN Data Plane and OpenFlow	**05 Hours**	**11%**

SDN Data Plane, OpenFlow Logical Network Device, OpenFlow Protocol

5.	SDN Control Plane & SDN Application Plane	**13 Hours**	**29%**

SDN Control Plane Architecture, ITU-T Model, OpenDaylight, REST, Cooperation and Coordination Among Controllers, SDN Application Plane Architecture, Network Services Abstraction Layer, Traffic Engineering, Measurement and Monitoring, Security, Data Center Networking, Mobility and Wireless, Information-Centric Networking

D. Instructional Method and Pedagogy:

- Lectures will be taken in class room with the use of multi-media presentations and black board – mix of both.
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Minimum 5 experiments shall be there in the laboratory related to course contents.
- Research / technical papers in relevant areas must be covered.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

E. Student Learning Outcomes:

By taking this course,

- Students will be able to differentiate between traditional network and software defined network.
- Student will learn QoS(Quality of service) is termed into QoE(Quality of Experience).
- Students will know requirement of Control plane and Data plane.
- Students will know measurements and monitoring of network using SDN.

F. Recommended Study Material:

❖ **Text Books:**

1. William Stallings, Florence Agboma, Sofiene Jelassi "Foundations of Modern Networking, SDN, NFV, QoE, IoT, and Cloud"; Pearson Publisher, ISBN-13: 978-0-13-417539-3
2. Behrouz A. Forouzan, "TCP/IP Protocol Suite.", Fourth Reprint, 2003;Tata McGraw Hill ISBN: 0-07-049551-3

❖ **Reference Books:**

1. Douglas E. Comer and David L. Stevens, "Internetworking with TCP/IP Volume-2, Design, Implementation and Internals ", Prentice Hall

❖ **Web Materials:**

1. https://www.sdxcentral.com/
2. https://sdn.ieee.org/standardization
3. https://trac.ietf.org/trac/irtf/wiki/sdnrg
4. https://www.opennetworking.org/sdn-resources/openflow
5. https://www.opendaylight.org/
6. https://www.opennetworking.org/

IT472: High Performance Computer Architecture [Elective-III]

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	03	02	00	05	04
Marks	100	50	00	150	

A. Objectives of the Course:

Objectives of introducing this subject at first year level in all the branches are:

- The course objective is to gain the knowledge required to design and analyze high performance computer systems.
- To understand and overcome the challenges in the design of next-generation memory systems for large-scale high performance computer systems.
- To Build Application to and optimize it to run on high performance computer systems.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of
1	Review of Basic Organization and Architectural Techniques	7
2	Instruction Level Parallelism	11
3	Memory Hierarchies	11
4	Thread Level Parallelism	06
5	Process Level Parallelism	05
6	Peripheral Devices	05

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. Detailed Syllabus:

1	**Review of Basic Organization and Architectural Techniques RISC processors**	**07 Hrs.**	**15 %**
1.1	RISC processors and Characteristics of RISC processors		
1.2	RISC Vs CISC		
1.3	Classification of Instruction Set Architectures		
1.4	Review of performance		
1.5	Measurements Basic parallel processing techniques: instruction level, thread level and process level		
1.5	Classification of parallel architectures		
2	**Instruction Level Parallelism**	**11 Hrs.**	**25 %**
2.1	Basic concepts of pipelining		
2.2	Pipelining Hazards and Solutions		
2.3	Instruction-level parallelism using software approaches		
2.4	Superscalar techniques		
2.5	Speculative execution		
2.6	Review of modern processors /*The objective is to explain how ILP techniques have been deployed in modern processors*/ i. Pentium Processor: IA 32 and P6 microarchitectures ii. ARM Processor		
	Pentium Processor: IA 32 and P6 micro-architectures ARM Processor		
3	**Memory Hierarchies**	**11 Hrs.**	**25 %**
3.1	Basic concept of hierarchical memory organization: Main memory, Cache memory and Optimization, Virtual memory.		
3.2	Memory protection and Evaluating memory hierarchy performance		
3.3	RAID		
4	**Thread Level Parallelism**	**06 Hrs.**	**13 %**
4.1	Centralized vs. distributed shared memory		
4.2	Interconnection topologies		
4.3	Synchronization and Memory consistency		
4.4	Review of modern multiprocessors		
5	**Process Level Parallelism**	**05 Hrs.**	**11 %**
5.1	Distributed Computing		

5.2 Grid

5.3 Cluster

5.4 Mainframe Computers

6	**Peripheral Devices**	**05 Hrs.**	**11 %**

6.1 Bus structures and standards

6.2 Types and uses of storage devices

6.3 I/O system design and Interfacing I/O to the rest of the system

6.4 Reliability and availability

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 10 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignment/Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a design laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Design of major problems/Tutorials related to course content will be carried out in the laboratory.
- In the lectures and laboratory discipline and behavior will be observed strictly.

E. Student Learning Outcomes:

- This course will provide fundamental knowledge of memory architecture of high performance computer systems.
- At the end of this course students will be able to understand challenge issues while designing programs for high performance computer systems.
- At the end of this course students will be able to write programs for high performance computer systems.

F. Recommended Study Material:

❖ **Text Books:**

1. Hennessey and Patterson, "Computer Architecture: A quantitative Approach", Morgan Kaufman.
2. Rajkumar Buyya "High Performance Cluster Computing: Architectures and Systems"

❖ **Reference Books:**

1. Jacek Radajewski and Dr. Douglas Eadline "HOW TO build a Beowulf Cluster"
2. "*SCL Cluster Cookbook*" from the Scalable Computing Laboratory at Ames.

❖ **Web Materials:**

1. SIMA, "Advanced Computer Architectures", Addison-Wesley.
2. http://www.buyya.com/cluster/v1toc.pdf
3. http://nptel.ac.in/syllabus/106105033/

IT473: ARTIFICIAL INTELLIGENCE [Elective-III]

Credit and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	-	5	4
Marks	100	50	-	150	

A. Objective of the Course:

The main objectives for offering the course Artificial Intelligence are:

- To learn about the most effective AI techniques, and gain practice implementing them
- To able to effectively use the common planning, reasoning, logic "tricks".
- To understand industry best-practices for building AI applications.
- To learn how to quickly and powerfully apply these techniques to new problems.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to AI, Problems and Search, Heuristic Techniques	10
2.	Logic in Intelligent System	10
3.	Knowledge Representation	06
4.	Learning	07
5.	Uncertainty	06
6.	Planning and Advanced Topics	06

Total hours (Theory): 45
Total hours (Lab): 30
Total hours: 75

C. Detailed Syllabus:

1.	**Introduction to AI, Problems and Search, Heuristic Techniques** Problem representation; State Space Search; A* Algorithm and its Properties; AO* search, Minimax and alpha-beta pruning, AI in games.	**10 Hours**	**22%**
2.	**Logic in Intelligent System** Predicate Logic & Propositional Logic, Resolution, Formal Systems; Notion of Proof, Decidability, Soundness, Consistency and Completeness; Predicate Calculus (PC), Resolution Refutation.	**10 Hours**	**22%**
3.	**Knowledge Representation** PC based Knowledge Representation, Intelligent Question Answering, Semantic Net, Frames, Script, Conceptual Dependency, Ontologies, Basics of Semantic Web.	**06 Hours**	**13%**
4.	**Learning** Learning from Examples, Decision Trees, Neural Nets, Hidden Markov Models, Reinforcement Learning, and Learnability Theory.	**07 Hours**	**16%**
5.	**Uncertainty** Formal and Empirical approaches including Bayesian Theory, Fuzzy Logic, Non-monotonic Logic, Default Reasoning.	**06 Hours**	**13%**
6.	**Planning and Advanced Topics** **Planning:** Blocks World, STRIPS, Constraint Satisfaction, Basics of Probabilistic Planning. **Advanced Topics:** Introduction to topics like Computer Vision, Expert Systems, Natural Language Processing, Big data, Neuro Computing, Robotics, Web Search.	**06 Hours**	**14%**

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory which carries 5 Marks weightage.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 15 Marks as a part of internal theory evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval. It carries a weightage of 5 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted which carries 5 Marks as a part of internal theory evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Student Learning Outcome:

Upon completion of this course, students will be able:

1. To solve difficult and complex problem of computer science using AI techniques.
2. To select any R&D field related to application of AI.
3. To understand soft computing and machine learning courses.
4. To develop software solution as per need of today's IT edge which requires high automation and less human intervention.
5. To demonstrate working knowledge in Python in order to write and explore more sophisticated Python programs
6. To apply knowledge representation, reasoning, and machine learning techniques to real-world problems

G. Recommended Study Material:

❖ **Text Books:**

1. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, 3rd edition, Pearson, 2010.
2. Elaine Rich & Kevin Knight, "Artificial Intelligence", McGraw-Hill Science/Engineering/Math; 2nd edition

❖ **Reference Books:**

1. Nilsson, N.J., "Artificial Intelligence, a New Approach", Morgan Kaufmann, 2000.
2. Mitchell, T., "Machine Learning", McGraw-Hill, 1997.

❖ **Papers:**

1. Journals: Artificial Intelligence, Artificial Intelligence Programming, Machine Learning, IEEE Expert, Data and Knowledge Engineering, Pattern Recognition etc.
1. Conferences: AAAI, IJCAI, UAI, ICML, ACL etc.

❖ **Web Materials:**

1. http://www-formal.stanford.edu/jmc/whatisai/whatisai.html
2. http://www.webopedia.com/TERM/A/artificial_intelligence.html

IT445: SOFTWARE GROUP PROJECT - IV

Credit and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	0	4	2	2
Marks	0	50	50	

A. Objective of the Course:

The main objectives for offering the course software project are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently.
- To provide exposure in the field of Software development.
- To provide a deep understanding of various domains of software projects.
- To provide an innovative ability to solve practical/utility problems.
- To provide a capacity to learn continually and interact with multidisciplinary groups.

B. Outline of the Course:

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students are required to get approval of project definition from the department.
- After approval of project definition students are required to report their project work weekly to respective internal guide.
- Project will be evaluated at least once per week in laboratory during the semester and final submission at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as a solution of particular problem by applying principles of Software Engineering.
- Students have to submit project with following listed documents at the time of final submission.
- Project Synopsis
    a. Software Requirement Specification

b. SPMP

c. Final Project Report

d. Project Setup file with Source code

e. Project Presentation (PPT)

- A student has to produce some useful outcome by conducting experiments or project work.

Total hours (Theory): 00

Total hours (Lab): 60

Total hours: 60

C. Instructional Method and Pedagogy:

1. Project Groups would be form of maximum two students.
2. Inter batch group formation is not permitted due to difficulties in progress tracking.
3. Students are advised to choose innovative and challenging definitions.
4. Batch wise project definitions must be unique.
5. Any management system would not be encouraged.
6. Tools like GitHub would be used to track the progress of project development by the concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
7. Student has to prepare report at end of semester as part of submission.
8. Report structure is finalized for semester end submission.
9. To have a better outcome as well as progress tracking at the end of semester, it is decided that students have to appear for two internal reviews, which will help them to get more insight in the project.

D. Student Learning Outcome:

After the completion of the course students will able to

- Explore the new ideas & the possible areas to work ahead.
- Use the various methodologies useful for doing project work.
- Investigate the chosen topic in depth. This implies collecting and reviewing literature and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or project topic.
- Apply the concepts and theories learnt in previous years of study and work placements

E. Recommended Study Material:

1. Reading Materials, web materials, Project reports with full citations
2. Books, magazines & Journals of related topics
3. Various software tools and programming languages compiler related to topic

❖ **Web Links:**

1. www.ieeexplore.ieee.org
2. www.sciencedirect.com
3. www.elsevier.com

IT446: SUMMER INTERNSHIP-II

Credit and Hours:

Teaching Scheme	Project	Total	Credit
Hours	90	90	3
Marks	150	150	

B. Objective of the Course:

Summer internships are required to be carried out in order to help students to find and know the applications of their theoretical knowledge enhance their company/industry/organization experience, get familiar with the company/industry/organization culture and work ethics.

The main objectives for offering the internship for the students are:

- To get perspective and experience of the field
- To make students company/industry/organization ready
- To get familiar with modern tools and technologies
- To enhance technical writing skills in reporting as per the company/industry/organization standards
- To get involved in design, development and testing practices followed in the company/industry/organization
- To enhance their soft-skills, presentation skills, interpersonal skills, documentation skills and office etiquettes required to sustain in company/industry/organization environment
- To participate in teamwork and preferably as part of a multi-disciplinary team
- To understand the professional and ethical responsibilities of an engineer
- To make them more productive, consistent and punctual.
- To make them aware about company/industry/organization best practices, processes and regulations.

B. Instructional Method and Pedagogy:

- Summer internship shall be at least 90 hours during the summer vacation only.
- Department/Institute will help students to find an appropriate company/industry/organization for the summer internship.
- The student must fill up and get approved a Summer Internship Acceptance form by the company and provide it to the Coordinator of the department within the specified deadline.
- Students shall commence the internship after the approval of the department Coordinator. Summer internships in research centers is also allowed.
- During the entire period of internship, the student shall obey the rules and regulations of the company/industry/organization and those of the University.
- Due to inevitable reasons, if the student will not able to attend the internship for few days with the permission of the supervisor, the department Coordinator should be informed via e-mail and these days should be compensated later.
- The student shall submit two documents to the Coordinator for the evaluation of the summer internship:
    - Summer Internship Report
    - Summer Internship Assessment Form
- Upon the completion of summer internship, a hard copy of "Summer Internship Report" must be submitted through the presentation to the Coordinator by the first day of the new term.
- The report must outline the experience and observations gained through practical internship, in accordance with the required content and the format described in this guideline. Each report will be evaluated by a faculty member of the department on a satisfactory/unsatisfactory basis at the beginning of the semester.
- If the evaluation of the report is unsatisfactory, it shall be returned to the student for revision and/or rewriting. If the revised report is still unsatisfactory the student shall be requested to repeat the summer internship.

C. Format of Summer Internship Report:

The report shall comply with the summer internship program principles. Main headings are to be centered and written in capital boldface letters. Sub-titles shall be written in small

letters and boldface. The typeface shall be Times New Roman font with 12pt. All the margins shall be 2.5cm. The report shall be submitted in printed form and filed. An electronic copy of the report shall be recorded in a CD and enclosed in the report. Each report shall be bound in a simple wire vinyl file and contain the following sections:

- Cover Page
- Page of Approval and Grading
- Abstract page: An abstract gives the essence of the report (usually less than one page). Abstract is written after the report is completed. It must contain the purpose and scope of internship, the actual work done in the plant, and conclusions arrived at.
- TABLE OF CONTENTS (with the corresponding page numbers)
- LIST OF FIGURES AND TABLES (with the corresponding page numbers)
- DESCRIPTION OF THE COMPANY/INDUSTRY/ORGANISATION: Summarize the work type, administrative structure, number of employees (how many engineers, under which division, etc.), etc. Provide information regarding
    - Location and spread of the company
    - Number of employees, engineers, technicians, administrators in the company
    - Divisions of the company
    - Your group and division
    - Administrative tree (if available)
    - Main functions of the company
    - Customer profile and market share
- INTRODUCTION: In this section, give the purpose of the summer internship, reasons for choosing the location and company, and general information regarding the nature of work you carried out.
- PROBLEM STATEMENT: What is the problem you are solving, and what are the reasons and causes of this problem.
- SOLUTION: In this section, describe what you did and what you observed during the summer internship. It is very important that majority of what you write should be based on what you did and observed that truly belongs to the company/industry/organization.

- CONCLUSIONS: In the last section, summarize the summer internship activities. Present your observations, contributions and intellectual benefits. If this is your second summer internship, compare the first and second summer internships and your preferences.
- REFERENCES: List any source you have used in the document including books, articles and web sites in a consistent format.
- APPENDICES: If you have supplementary material (not appropriate for the main body of the report), you can place them here. These could be schematics, algorithms, drawings, etc. If the document is a datasheet and it can be easily accessed from the internet, then you can refer to it with the appropriate internet link and document number. In this manner you don't have to print it and waste tons of paper.

D. Learning outcomes:

After completion of the course students, will able:

- To apply knowledge and skills learned in company/industry/organization to real-world problems.
- To solve engineering problems.
- To function in a team work.
- To work with teammates from other disciplines.
- To use experience related to professional and ethical issues in the work environment.
- To explain the impact of engineering solutions developed in a project, in a global, economic, environmental, and societal context.
- To finds relevant sources (e.g., library, Internet, experts) and gather information.
- To demonstrate knowledge of contemporary issues related with engineering in general.
- To use new tools and technologies

B. Tech. (Information Technology) Programme

SYLLABI

(Semester –8)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT407: SOFTWARE PROJECT MAJOR

Credit Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	0	36	36	20
Marks	0	600(250+350)	600	

A. Objective of the Course:

Main objectives for offering the course are:

- To provide additional technical skill useful for the project work
- To develop and test one's ability to learn independently
- To provide exposure in the field of Software development
- To provide a deep understanding of various domains of software projects
- To provide an innovative ability to solve practical/utility problems
- To provide a capacity to learn continually and interact with multidisciplinary groups

B. Outline of the Course:

- Software Project includes course work on a specialized Subject or a Seminar.
- The course work shall be related to the area of his/her project research work.
- Students have to take 3 months training to the other software industry as the project work.
- The major project work provides students an opportunity to do something on their own and under the supervision of internal guide as well as guide from industry.
- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Project will be evaluated at least thrice during the semester by internal guide of the project and final submission at the end of the semester as a part of continuous evaluation.
- Project work should include whole SDLC of development of software / hardware system as solution of particular problem by applying principles of Software Engineering.

- A student has to produce some useful outcome by conducting experiments or project work.
- Student can learn all aspects & functionality of specialized software from the industry.
- Students have to submit SRS, SPMP, Design documents, Code and Test Cases in form of Project report.

C. Instructional Method and Pedagogy:

Following are the General guidelines:

1) Semester 8th, teaching scheme is Practical 36 hours, with 20 credits worth of 600 marks (Out of 600 marks, 250 marks of internal and 350 marks of external evaluation)
   Note:
   a) Each defined project definition should be from Industry/Research organization/ Govt.organization/ technical issues/Real world problems.
   b) If industry defined project then maximum 2 or 3 students are allowed per project group. If in-house project then no group is allowed.
   c) The students are required to identify their problem and they are required to follow all the rules and instructions issued by department.

Final Year Project Policy:

1. Process for NOC:
Following is the process for 8th semester project for definition and company approval:

1. Select your domain
2. Select your company
3. Approve company from HoD Sir/TPR
4. Issue recommendation letter from TPR (write company address in to, fill the details of students and bring its printed copy and submit to concern TPR.)
5. Issue confirmation letter from company with brief definition, tools & technology (submit Xerox copy to concern TPR)
6. Approve definition form HoD Sir / Sr. faulty/TPR
7. The Process for Approval of the Project Definition:
8. The students must meet and discuss the definition of their final semester project with the HoD Sir/Faculty Member-Guide and get his approval by verifying to see that the following parameters:

7. The proposed project quality should be up to the status of a B.Tech final semester project quality.
8. The project should not be a conventional project.
9. The project should not be a purchased/3rd party developed project.
10. If the project is being carried forwarded from previous years then it must add substantial value to the previously done work on the project.
11. The project should be novel, original and having a possibility of good impact if the proposed solution get implemented.
12. Even if student claim it to be an Industry defined project, it should not be based on industry whose main objective is to make final semester project and give it to students.
13. Issue NOC from TPO (submit Xerox copy to Concern TPR)
14. In order to improve student's performance we are doing following exercise:
    1. Industrial visit
    2. Review and suggestions from internal guide
    3. Feedback from external guide

2. Process for Continuous Evaluation:
Following is the process for 8th semester project continuous evaluation:

15. Submit your project profile & synopsis to your internal Guide.
16. Report weekly to your internal guide with filled weekly report (At least 10 reporting is mandatory)
17. 2 internal presentations & 1 final presentation with project demonstration are required. Each internal presentation carries 50 Marks, 100 marks for report and 50 marks from internal guide & External presentation carries 350 marks.

a. Observation Canvas: Observation points from survey, Users, Stockholders, Activities
b. Ideation Canvas: People, Activities, Problem (that you are going to solve), Situation/Context/Location, Possible Solutions
c. Project Development Canvas: Purpose, People, Product Experience, Product Functions, Product Features, Components, Customer Revalidation
d. Business Model Canvas: Applications, Usage & Outcome

18. Submit hard binding report with CD.

3. Continuous evaluation Marks:

Project guide has to put the marks according to grade.

Range is given below:

A+ : 47-50

A : 44-46

A- : 41 - 43

B+ : 36-40

B : 31- 35

B- :26 - 30

C+ : 21-25

C : 16 - 20

C- : <=15

As per the performance of students, guide can give the marks.

For example: A+: One can give 47 - 50 as per performance.

D. Recommended Chapters/sections

1. Microscope Summery

2.Details of candidate and supervisor along with certificate of

- original work;
- Assistance, if any;
- Credits;

3. Aims and Objectives

4. Approaches to Project and Time Frame

5. Project Design Description with appendices to cover

Flow charts/Data Flow Diagram – Macro/Micro Level

Source code, If any

Hardware platform

Software Tools

Security Measures

Quality Assurance

Audit ability

7. Test Date and Result

E. Student Learning Outcome:

After the completion of the course students will able to

- Explore the new ideas & the possible areas to work ahead.
- Use the various methodologies useful for doing project work.
- Investigate the chosen topic in depth. This implies collecting and reviewing literature and understanding and interpreting the most up-to-date concepts and theories of your chosen academic field and/or project topic.
- Apply the concepts and theories learnt in previous years of study and work placements

F. Recommended Study Material:

❖ Books

1. Reading Materials, web materials, Project reports with full citations
2. Books, magazines & Journals of related topics
3. Various software tools and programming languages compiler related to topic

❖ Web Link:

1. www.ieeexplore.ieee.org
2. www.sciencedirect.com
3. www.elsevier.com
4. http://spie.org/x576.xml