CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Technology & Engineering

Bachelor of Technology Programme

Information Technology

(B.Tech. IT)

ACADEMIC REGULATIONS & SYLLABUS

(Choice Based Credit System)

Faculty of Technology and Engineering

B. Tech. Programme

(Information Technology)

Chandubhai S. Patel Institute of Technology

Devang Patel Institute of Advance Technology and Research

FACULTY OF TECHNOLOGY AND ENGINEERING

ACADEMIC REGULATIONS

Bachelor of Technology Programme

Choice Based Credit System

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

Choice based Credit System with Semester pattern of education shall 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 course works in the chosen subject of specialization and also complete a project/dissertation if any. Apart from the Programme Core courses, provision for choosing University level electives and Programme/Institutional level electives are available under the Choice based credit system.

2) Duration of Programme

i) Undergraduate Programme (B. Tech)

Minimum 8 semesters (4 academic years)
Maximum 16 semesters (8 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 – 1 attached

6) Attendance

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

6.2 Student 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, the continuous assessment will be conducted by the respective department/institute.

7.1.2 Final end-semester examination by the University through written paper or practical test or oral test or presentation by the student or a combination of these.

7.1.3 The weightages of continuous assessment and End-semester university examination in overall assessment shall depend on individual course as approved by Academic Council through Board of Studies.

7.1.4 The performance of candidate in continuous assessment and in end-semester examination together (if applicable) shall be considered for deciding the final grade in a course.

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

7.2 Performanceincontinuousassessmentandend-semesterUniversityExamination

7.2.1 Minimum performance with respect to continuous assessment as well as end-semester university examination will be an important consideration for passing

a course. Details of minimum percentage of marks to be obtained in the examinations are as follows.

Minimum percentage marks to be obtained in end-semester University Examination (for applicable course)	Minimum Overall percentage marks to be obtained in each course.
40%	45%

7.2.2 If a candidate obtains minimum required percentage of marks in end-semester university examination in applicable course but fails to obtain minimum required overall percentage of marks, he/she has to repeat the examination till the minimum required overall percentage of marks are obtained.

8) Grade Point System

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 1 **Grade Point System (UG)**

Range of Marks (%)	**≥80**	**<80 ≥73**	**<73 ≥66**	**<66 ≥60**	**<60 ≥55**	**<55 ≥50**	**<50 ≥45**	**<45**
Grade	**AA**	**AB**	**BB**	**BC**	**CC**	**CD**	**DD**	**FF**
Grade Point	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**0**

2. The student's performance in any semester will be assessed by the Semester Grade Point Average (SGPA). Similarly, his 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 = $\sum C_i G_i / \sum C_i$ 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 = $\sum C_i G_i / \sum C_i$ where C_i is the number of credits of coursei

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.

9) Award of Class

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

Award of Class	CGPA Range
Distinction	CGPA ≥ 7.5 & ≤ 10.0
First class	CGPA ≥ 6.0 & < 7.5
Second Class	CGPA ≥ 5.0 & < 6.0

Grade sheets of only the final semester shall indicate the class. In case of all the other semesters, it will simply indicate as Pass / Fail.

10) Detention Criteria

☞ A student will be promoted to next year only if he/she has cleared all the courses of the year he/she is studying in.

☞ A Student will not be allowed to move to second year if he/she has not cleared all the courses of first year.

☞ A student will not be allowed to move to third year if he/she has not cleared all the courses of second year.

☞ A student will not be allowed to move to fourth year if he/she has not cleared all the courses of third year.

11)Transcript

☞ A transcript issued to the student at the time of leaving the university will contain a consolidated record of all the courses taken by him/her, grades obtained and the final CGPA.

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY (CHARUSAT)

FACULTY OF TECHNOLOGY & ENGINEERING (FTE)

CHOICE BASED CREDIT SYSTEM

FOR

BACHELOR OF TECHNOLOGY & ENGINEERING

CHOICE BASED CREDIT SYSTEM

With the aim of incorporating the various guidelines initiated by the University Grants Commission (UGC) to bring equality, efficiency and excellence in the Higher Education System, Choice Based Credit System (CBCS) has been adopted. CBCS offers wide range of choices to students in all semesters to choose the courses based on their aptitude and career objectives. It accelerates the teaching-learning process and provides flexibility to students to opt for the courses of their choice and / or undergo additional courses to strengthen their Knowledge, Skills and Attitude.

1. CBCS – Conceptual Definitions / Key Terms(Terminologies)

Types of Courses: The Programme Structure consist of 4 types of courses: Foundation courses, Core courses, Elective courses and Non-credit (audit) courses.

1.1) Foundation Course

These courses are offered by the institute in order to prepare students for studying courses to be offered at higher levels.

1.2) Core Courses

A Course which shall compulsorily be studied by a candidate to complete the requirements of a degree / diploma in a said programme of study is defined as a core course. Following core courses are incorporated in CBCS structure:

A. University Core courses(UC):

University core courses are compulsory courses which are offered across university and must be completed in order to meet the requirements of programme. Environmental science will be a compulsory University core for all Undergraduate Programmes.

B. Programme Core courses (PC):

Programme core courses are compulsory courses offered by respective programme owners, which must be completed in order to meet the requirements of programme.

1.3) Elective Courses

Generally, a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline of study or which provides an extended scope or which enables an exposure to some other discipline / domain or nurtures the candidates proficiency / skill is called an elective course. Following elective courses are incorporated in CBCS structure:

A. University Elective Courses (UE):

The pool of elective courses offered across all faculties / programmes. As a general guideline, Programme should incorporate 2 University Electives of 2 credits each (total 4 credits).

B. Institute Elective Course(IE)

Institute elective courses are those courses which any students of the University/Institute of a Particular Level (PG/UG) will choose as offered or decided by the University/Institute from time-to-time irrespective of their Programme /Specialization.

C. Programme Elective Courses (PE):

The programme specific pool of elective courses offered by respective programme.

D. Cluster Elective Course (CE):

An ‘Elective Course’ is a course which students can choose from the given set of functional course/Area or Streams of Specialization options (eg. Common Courses to EC/CE/IT/EE) as offered or decided by the Institute from time-to-time.

1.4) Non Credit Course (NC) – AUDIT Course

A ‘Non Credit Course’ is a course where students will receive Participation orCourse Completion certificate. This will be reflected in Student’s Grade Sheetbut the grade of the course will not be considered to calculate SGPA and CGPA.Attendance and Course Assessment is compulsory for Non Credit Courses.

1.5) Medium of Instruction

The Medium of Instruction will be English.

Charotar University of Science & Technology

Chandubhai S Patel Institute of Technology

Devang Patel Institute of Advance Technology and Research

Department of Information Technology

Vision

To become a front-runner for quality education, development and research in the field of IT.

Mission

- *To prepare next-generation technocrats for societal upliftment.*
- *To inculcate moral and ethical values for building vibrant nation.*

	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/Project		Total
			Theory	Practical	Tutorial	Project	Total		Internal	External	Internal	External	
SY Sem-4	MA261	Statistical and Numerical Techniques	3	2	0	0	5	4	30	70	0	0	100
	IT263	Computer Architecture & Microprocessor Interfacing	4	2	0	0	6	5	30	70	25	25	150
	IT261	Computer Networks	3	2	0	0	5	4	30	70	25	25	150
	IT265	Design and analysis of Algorithms	4	2	0	0	6	5	30	70	25	25	150
	IT264	Full Stack Web Development	0	4	0	0	4	2	-	-	50	50	100
	IT266	Project – 1	0	0	0	2	2	1	-	-	50	50	100
	HS111.02A	Human Value and Professional Ethics	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	0	0	0	0	0	0	0	0	0	0
			14	**12**	**0**	**2**	**30**	**25**	**240**	**280**	**255**	**245**	**950**

	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 -6	IT364	Mobile Application Development	0	2	0	0	2	2	0	0	25	25	50
	IT360	Computer Networks	3	2	0	0	5	4	30	70	25	25	150
	IT348	Cryptography & Network Security	4	2	0	0	6	5	30	70	25	25	150
	IT359	Machine Learning	3	2	0	0	5	4	30	70	25	25	150
		Elective-II	3	2	0	0	5	4	30	70	25	25	150
	IT356	Software Group Project - III	0	0	0	2	2	1	0	0	25	25	50
	HS132 .02A	Contributory Personality Development	0	2	0	0	2	2	-	-	30	70	100
	Assignment Practices/Student Counseling/Remedial Classes		0	0	0	0	0	0	0	0	0	0	0
			13	**12**	**0**	**0**	**27**	**22**	**120**	**280**	**180**	**220**	**800**

	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-8	IT447	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					
	Code	**Elective - I**	**Code**	**Elective – II**	**Code**	**Elective - III**
	IT381	Artificial Intelligence	IT384	Blockchain Technologies	IT475	Data Analytics &Visualization
	IT382	Cyber Security	IT385	DevOps	IT476	Network Defense &Ethical Hacking
	IT383	Python Programming and Hardware Interfacing	IT379	Computer Vision	IT477	Service Oriented Architecture

HS Elective - I
HS101.02A – Communicative English

HS Elective - II
HS201.02 A – Painting
HS202.02 A – Photography
HS205.02 A - Media and Graphic Design
HS209.02 A – Dramatics
HS210.02 - Contemporary Dance

HS Elective - III
HS121.02 A - Creativity, ProblemSolving and Innovation

HS Elective - IV
HS111.02 A Human Values And Professional Ethics

HS Elective - V
HS111.02 A Human Values And Professional Ethics

HS Elective - VI
HS132.02 A Contributory Personality Development

B.Tech. (Information Technology) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

A. Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	1	5	4
Marks	100	50	150	

B. Outline of the course:

Sr No.	Title of the unit	Minimum number of hours
1.	Sampling Distributions and Test of Hypotheses	12
2.	Simulation	12
3.	Simple Regression and Simple Correlation	06
4.	Interpolation and Curve Fitting	15
5.	Numerical Integration, Solution of Different Types of Equations.	15
	Total hours	60

C. Detailed Syllabus:

1. Sampling Distributions and Test of Hypotheses: 12 Hours 20%

1.1 Population and sample, function of random variables associated with normal distribution,Central limit theorem.

1.2 Random sampling, Sample moments and their distributions: Chi-square, t and F distributions.

1.3 Point estimation and interval estimation:Estimation of population mean, population variance, population proportion, one population and two populations.

1.4 Introduction to hypothesis Testing, z- test, t-test, chi-square test and F-test, one sample and two samples tests.

2. Simulation: 12 Hours 20%

2.1 Introduction to random numbers.

2.2 Generating random numbers from probability distributions: Binomial, Poisson, Uniform, Exponential and Normal.

2.3 Variance reduction techniques.

2.4 Markov Chain, Monte Carlo Method and its applications.

3. Simple Regression and Simple Correlation: 06 Hours 10%

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. Interpolation and Curve fitting: 15 Hours 25%

4.1 Errors in numerical analysis: types of errors, sources of errors.

4.2 Interpolation, Lagrange's interpolation formula.Newton's divided difference table and Newton's Interpolation polynomial.

4.3 Finite differences and associated operators.

4.4 Newton's forward interpolation formula, Newton's backward interpolation formula.

4.5 Least squares curve fitting methods, linear and quadratic curve fitting.

5. Numerical Integration and Numerical Solution of Different Types of Equations: 15 Hours 25%

5.1 Numerical Integration: Rectangle rule, trapezoidal rule and Simpson's rules (1/3 and 3/8) andtheir composite rules.

5.2 Numerical solution of equations: Bisection method, False position (Regula-Falsi) and Newton-Raphson method.

5.3 Numerical solution of system of simultaneous linear equations: Gauss Jacobi Method and Gauss Seidel Method.

5.4 Numerical Solution of Ordinary Differential Equations: Taylor's series, Euler's, and Runge- Kutta (2^{nd} and 4^{th} order) methods.

D. Instructional Method and Pedagogy:

- At the starting of the course, the course delivery pattern, prerequisite of the subjectmust be discussed.
- Lectures may be conducted with the aid of multi-media projector, black board, OHPetc.
- Attendance is compulsory in lectures which carries a 5% component of the overallevaluation.
- Minimum two internal tests/unit testsmust be conducted and average of two will beconsidered as a part of 15% overall evaluation.
- Quizzes (surprise tests) /Oral tests/ Viva/Assignments will be conducted whichcarries 10% component of the overall evaluation.

E. Student Learning Outcomes:

At the end of the course, the students will be able to

CO1.	• Differentiate between population and sample distribution. Parameter andStatistic • Calculate confidence interval for parameter • Formulate null and alternate hypothesis • Solve the test of hypothesis problems

CO2.	• Relate the real system with virtual system • Construct simulation algorithm to generate random numbers • Verify the stated results of variance reduction
CO3.	• Identify the nature of relationship between two variables • Describe the scatter diagrams • Calculate correlation coefficient, regression coefficients
CO4.	• Examine the types of error in numerical computations • Differentiate the interpolation techniques and curve fitting techniques • Create the divided difference table • Solve the problems of interpolation • Solve the problems of curve fitting
CO5.	• Identify the types of equations • Solve the problems of numerical integration • Reproduce the algorithms of numerical solution of equations • Calculate the errors of approximations.
CO6.	• Follow the various techniques of statistical methods and numerical methods • Adopt the applications of these methods using computer • Create the computer algorithms of these methods

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO2	3	3	-	3	3	-	-	-	-	-	-	-	3	-
CO3	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO4	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO5	3	3	-	1	1	-	-	-	-	-	-	-	3	-
CO6	3	3	-	3	3	-	-	-	-	-	-	-	3	-

- Correlation levels 1, 2 or 3 as defined below:
- 1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

F. Recommended Study Material:

❖ **Text Books:**

1. Richard A. Johnson, Miller and Freund; Probability and Statistics for Engineers.Prentice Hall, 1994.
2. Ross Sheldon; A first course in probability. Pearson Education India, 2002.
3. Ross Sheldon; A course in simulation. Prentice Hall PTR, 1990.
4. Shankar S. Sastry; Introductory methods of numerical analysis. PHI Learning Pvt.Ltd., 2015.

❖ **Reference Books:**

1. Robert V. Hogg, Elliot Tanis and Dale Zimmerman; Probability and statisticalinference. Pearson Higher Ed, 2014.

2. Kishor S. Trivedi; Probability and statistics with reliability, queuing and computerscience applications. John Wiley & Sons, 2008.
3. Steven C.Chapra and Raymond P. Canale; Numerical methods for engineers. Vol.
2. New York: McGraw-Hill, 2012.
4. VaidyeswaranRajaraman; Computer oriented numerical methods. PHI Learning Pvt.Ltd., 1993.
5. Erwin Kreyszig: Advanced Engineering Mathematics, 9th Ed., Jhon Wiley & Sons,India, 1999.

❖ **URL Links:**

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

A. Credits and Hours:

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

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Computer Networks and the Internet	03
2.	Application Layer	10
3.	Transport Layer	13
4.	The Network Layer	10
5.	The Link Layer: Links, Access Networks, and LANs	06
6.	Network Management	03
	Total hours (Theory)	45
	Total hours (Lab)	30
	Total hours	75

C. Detailed Syllabus:

1.	**Computer Networks and the Internet**	**03 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**	**10 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**	**13 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**	**10 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**	**06 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**	**03 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 anappreciation for the concepts being taught in lectures.

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

E. Student Learning Outcome:

At the end of the course, the students will be able to

CO1	Analyze layered network architecture and passage of data over communicationlinks
CO2	Analyze delay models in Data Networks using Queueing Systems for messaging and delay sensitive applications
CO3	Design and analyze routing algorithms for Internet and multi-hop autonomousnetworks
CO4	Analyze flow and rate control algorithms between a sender and receiver in widearea networks
CO5	Apply the network fundamentals to analyze performance.
CO6	Use key networking algorithms in simulation.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	-	-	-	-	-	-	-	2	-
CO2	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO3	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO4	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	3	-	-	-	-	-	-	-	-	-

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

IT263: COMPUTER ARCHITECTUR & MICROPROCESSOR INTERFACING

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 are:

- To provide introduction to Instruction Set Architecture and Practical exposure through simulation tools/Microprocessor Kits
- 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, and Instruction Execution Unit.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Computer Architecture	03
2.	Instruction Set Architecture	05
3.	Computer Architecture Space	06
4.	Performance Measures	04
5.	Basics of Arithmetic Logic Unit	10
6.	Processor Design	10
7.	Pipelined Processor	06
8.	Memory Hierarchy	08
9.	Input/Output Subsystem	08

Total hours (Theory): 60
Total hours (Lab): 30
Total hours: 95

C. Detailed Syllabus:

1. **Introduction to Computing Systems** **03 Hours** **5%**

   What is Computer Architecture, Abstraction: Software & Hardware , Architecture Levels, Embedded Computers, Different types of processors, Five generation computers

   Looking into future: Grid Computing, Nano Computing, DNA Computing, Quantum Computing

2. **Instruction Set Architecture** **05 Hours** **8%**

	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, Recursive Programs: Activation Record, Calls, Returns(after instruction set architecture)		
3.	**Computer Architecture Space** Architecture Space: MIPS ISA Features, Alternative Architectures Architecture Examples: RISC and CISC, PowerPC, VAX, SPARC, Intel x86	**06 Hours**	**10%**
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** 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	**10 Hours**	**17%**
6.	**Processor Design** Introduction, Simple Design Multi cycle approach, control for multi cycle, Micro-programmed Control, Exception Handling	**10 Hours**	**17%**
7.	**Pipelined Processor** Basic Design Idea, Data path and Control, Handling Data Hazards, handling Control Hazards	**06 Hours**	**10%**
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	**08 Hours**	**13%**

9. **Input/output Subsystem** **08 Hours** **13%**

Interfaces and buses, I/O operations, Designing I/O 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 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:

After learning the course, students will able to

CO1	Identify the addressing mode of instructions and write machine program
CO2	Determine which hardware blocks and control lines are used for specific instructions
CO3	Demonstrate how to add and multiply integers and floating-point numbers using two's complement and IEEE floating point representation
CO4	Use various metrics to calculate and Analyze clock periods, performance, and instruction throughput of single-cycle, multi-cycle, and pipelined implementations of a simple instruction set
CO5	Detect pipeline hazards and identify possible solutions to those hazards to take advantage of super scalar architecture
CO6	Show how cache design parameters affect the performance of program and Map a virtual address into a physical address

Course Articulation Matrix:

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO1	1	-	3	-	2	-	-	-	-	-	-	-	2	-
CO2	1	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	2	3	-	3	3	-	-	-	-	3	-	-	2	-
CO5	1	2	1	1	-	-	-	-	-	-	-	1	-	2
CO6	1	1	-	-	-	-	-	-	-	-	-	1	-	1

F. Recommended Study Material:

❖ **Text Books:**

1. John L. Hennesy & David A. Patterson, Computer Organization and Design MIPS Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design)

❖ **Reference Books:**

1. R. E. Bryant and D. R. O'Hallaron, Computer Systems: A Programmer's Perspective, Prentice Hall
2. Computer Organization & Architecture-Designing for Performance, William Stalling, Pearson Prentice Hall (8th Edition).
3. 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.
4. Structured Computer Organization, A. S. Tananbum , Pearson Education
5. The Essentials of Computer Organization And Architecture, Linda Null, Julia Lobur, Jones & Bartlett Learning, 2006
6. Computer Architecture & Organization, John P Hayes, McGraw-Hill.
7. Computer System Architecture, Morris Mano (3rd Edition) Prentice Hall.

❖ **Web Materials:**

1. http://pages.cs.wisc.edu/~markhill/cs354/Fall2008/notes/flpt.apprec.html
2. https://www.youtube.com/watch?v=qlH4-oHnBb8
3. https://nptel.ac.in/courses/106105033/ (For cache memory and Pipelining)
4. https://www.ebookbou.edu.bd/Books/Text/SST/DCSA/dcsa_2301/Unit-08.pdf
5. https://www.youtube.com/playlist?list=PLxCzCOWd7aiHMonh3G6QNKq53C6oNXGrX

Credit and Hours:

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

A. Objective of the Course:

The main objectives for offering the course are:

- To use React JS for front-end development
- To use Node JS, Express JS for back-end development
- To explore various deployment environments
- To use various testing tools and version control.

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1.	Front end Development	20
2.	Back-end Development	20
3.	NoSQL Database	10
4.	Version Control & Code Analysis	04
5.	Testing & Deployment	06

Total hours (Theory): 00

Total hours (Lab): 60

Total hours: 60

Detailed Syllabus:

1.	Front end Development – React JS	10 Hours	33.33 %
	JavaScript Refresher Understanding JSX React Components & Hooks Styling Components Working with Environment Variables Understanding Props Understanding State & Handling Events in React Working with Forms Adding Router to the Application Refactoring App Component Hosting React App on Cloud Environments API Integration & Testing		
2.	Back-end Development – Node JS, Express JS	10 Hours	33.33 %
	Basics of Node JS & Execution Environment & Flow Setting Up Node JS Environment & Node Version Management Working with Node REPL Module Fundaments Exploring, Accessing & Building Modules Introduction to Back-End Frameworks Introduction and Setting Up / Configuring Express JS Understanding Express JS Project Structure & Scaffolding Understanding Middleware's & Routes Working with Environment Variables Database Integration Accessing & Building REST APIs Securing REST APIs Testing API		
3.	NoSQL Database – MongoDB	05 Hours	16.66 %
	Introduction to NoSQL Setting Up / On Premise / Cloud Environments Working with shell and Server Basic Syntax, Schemas and Relation Basics and CRUD Operation Working with indexes & Optimization		

	Aggregation Framework Security Basics		
4.	Version Control & Code Analysis	02 hours	06.68%
	Code Version Management Code Structure and Organization Coding Standards and Best Practices Error Handling and Logging Code Performance and Optimization Refactoring Code		
5.	Testing & Deployment	03 hours	10%
	Manual Testing Unit Testing Hosting Selection Trade Offs Preparing & Configuring Deployment Environment App Deployment & Accessing End to End Testing		

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 etc.
- Attendance is compulsory in lectures and laboratory.
- Marks will be given based on continues evaluation, i.e. Unit Tests/Surprise tests/Quizzes/Projects/Presentation and Assignments based on course content will be given to the students at the end of each unit/topic.
- 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. **Course Outcome (COs):**

At the end of the course, the students will be able to

CO1	Understanding Application Architecture and Environments
CO2	Developing cross-platforms Front End UI and Testing
CO3	Understanding Back-End and Developing REST APIs
CO4	Integrating Back-End with NoSQL Database & Applying Security
CO5	Developing Full stack App & Exploring Industry Best Practices
CO6	Configuring and Setting Up Cloud Environments & Deploying App

Course Articulation Matrix:

Course Outcome (CO)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	-	-	-	2	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	2	-	-	-	3	-	-	-	-
CO3	-	-	3	-	-	-	-	3	-	3	-	-	-	-
CO4	1	-	-	3	-	2	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	2	2	3	-	-	3	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

- **Reference Links/ e-content:**

1. https://reactjs.org/docs/getting-started.html
2. https://nodejs.org/en/docs/guides/
3. https://expressjs.com/
4. https://www.mongodb.com/docs/
5. https://kafka.apache.org/documentation/
6. https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/Welcome.html

A. Credit and Hours:

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

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Basics of Algorithm and Mathematics	08
2.	Analysis of Algorithm	08
3.	Divide and Conquer Algorithm	08
4.	Greedy Algorithm	08
5.	Dynamic Programming	10
6.	Exploring Graphs	10
7.	String Matching and NP Completeness	06
	Total hours (Theory) :	45
	Total hours (Lab) :	30
	Total hours :	75

C. Detailed Syllabus:

1. Basics of Algorithm and Mathematics **04 hours** **08%**

1.1 What is an algorithm?

1.2 Mathematics for Algorithm

1.3 Performance Analysis, Model for Analysis - Random AccessMachine (RAM), Primitive Operations

1.4 Time Complexity and Space Complexity

2. Analysis of Algorithm **08 hours** **18%**

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**	**18%**
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**	**07 hours**	**16%**
4.1	General Characteristics of greedy algorithms		
4.2	Problem solving using Greedy Algorithm: Making changeproblem The Knapsack Problem, Job Scheduling Problem		
4.3			
4.4	Minimum Spanning Trees (Kruskal's Algorithm, Prim's Algorithm)		
4.5	Dijkstra Algorithm		
5.	**Dynamic Programming**	**10 hours**	**23%**
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**	**04 hours**	**08%**
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**	**04 hours**	**08%**
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

CO1	Students will able to analyze the performance of algorithms.
CO2	Students will able to select appropriate design techniques for effective solution of the problem.
CO3	Ability to find time and space complexity of the algorithm.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	-	-	-	-	-	-	-
CO2	3	3	3	3	2	-	-	-	-	-	-	-
CO3	3	3	1	2	1	-	-	-	-	-	-	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial

(High)If there is no correlation, put "-"

F. Recommended Study Material:

❖ Text Books:

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

❖ Reference Books:

1. Thomas H. Coreman, Charles E. Leiserson, Ronald Rivest and Clifford Stein, Introduction to Algorithms, MIT Press
2. Ellis Horowitz, Sartaz Sahni and Sanguthevar Rajasekarn Fundamental of ComputerAlgorithms, 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

Credits and Hours:

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

A. Outline of the Course:

- Students 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 ofcontinuous 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/paper
    e. Project Setup file with Source code [Uploaded on GitHub]
    f. Project Presentation (PPT)
    g. Video Recording (Per Project)
- A student has to produce some useful outcome by conducting experiments orproject work.

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

B. 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.
- Any kind of management system would not be encouraged.
- Tools like GitHub would be used to track the progress of project development bythe concern faculty. Concerned guide will demonstrate the working of GitHub Tool.
- Student has to prepare Report/Paper at end of semester as part of submission.
- Report/Paper structure is finalized for semester end submission.
- To have a better outcome as well as progress tracking at the end of semester, it isdecided that students have to appear for 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 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 bring filled review card on the day of external review.

C. Student Learning Outcome:

After learning the course, students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.

CO5	Solve communication issues in large, complex software projects andStructure & communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

D. Recommended Study Material:

- **Reference book:**
  1. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
  2. Sanjay Mohapatra, Software Project Management, Cengage Learning
  3. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, "Engineering Design – A Project Based Introduction", Wiley India Pvt. Ltd.
  4. Hughes & M. Cotterell, "Software Project Management", Tata McgrawHills.
- **Web Materials:**

  1. https://status.net/templates/project-report/
  2. https://www.tutorialspoint.com/software_engineering/software_project_management.htm
  3. https://www.geeksforgeeks.org/coding-standards-and-guidelines/
  4. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/

B. Tech. (Information Technology) Programme

SYLLABI

(Semester – 6)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT364: Mobile Application Development

A. **Credits and Hours:**

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

B. **Outline of the Course:**

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction to Mobile App Development	02
2.	Flutter Basics	05
3.	Dart Programming	06
4.	Flutter User Interface (Flutter UI)	09
5.	Firebase Integration & Advanced Topics	04
6.	Native Application development using Kotlin(Android)	04
	Total hours (Theory) :	00
	Total hours (Lab) :	30
	Total hours :	30

C. **Detailed Syllabus:**

1. **Introduction to Mobile App Development** **02 Hours** **7%**
   Overview of mobile platforms, mobile app development lifecycle, User experience (UX) considerations for mobile apps
2. **Flutter Basics** **05 Hours** **17%**
   Introduction to Flutter and Dart, Flutter architecture and widgets, Comparison with other mobile app development frameworks, Components of flutter, Building user interfaces with Flutter
3. **Dart Programming** **06 Hours** **28%**
   Introduction to Dart programming language, Importing and using a library, Creating dart libraries, dart packages, Packages structure, Dart syntax, Dart data types, Dart functions, Dart classes and objects, Dart state management- built-in state management (setState)
4. **Flutter User Interface (Flutter UI)** **09 Hours** **28%**
   Introduction to Flutter, flutter compilation & rendering, widgets

	introduction, hello flutter, Understanding built-in widgets- Layout widgets, Styling widgets, Stateful widgets, Stateless widgets, Creating UI with widgets, creating custom widgets, Handling user gestures, validating input, custom input and form field, Navigation and Routing in Flutter.		
5.	**Firebase Integration & Advanced Topics** Introduction to Firebase platform, Firebase Authentication for user login and registration, Cloud Firestore for real-time data storage, Advanced animations and transitions in Flutter, Testing and Debugging app.	**04 Hours**	**14%**
6.	**Native Application development using Kotlin(Android)** Introduction, Why Kotlin? Data types, Functions, Looping & Ranges, Expression & statements, Objects Everywhere, Creating Class, Constructors, Packages, Exceptions, Property Accessors, overloading, Enumerations, Data Classes, Self-Calls & the Elvis Operator, Introduction to Generics.	**04 Hours**	**7%**

D. Course Outcome (COs):

At the end of the course, the students will be able to

CO1	Create visually appealing and responsive UIs using Flutter widgets and styling techniques.
CO2	Apply state management solutions to handle user interactions and maintain app state.
CO3	Develop Android-specific features using the Kotlin programming language.
CO4	Test and debug mobile applications to ensure functionality and performance.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	2	-	-	-	-	-	-	-	1	-
CO2	3	2	3	1	3	-	-	-	-	-	-	-	2	-
CO3	2	2	2	2	3	-	-	-	-	-	-	-	1	-
CO4	1	2	2	1	3	-	-	-	-	-	-	-	1	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Text book:**

1. Bruce Eckel and Svetlana Isakova, Atomic Kotlin, Mindview LLC.
2. Alessandro Biessek, Flutter for Beginners, Packt Publishing Limited

- **Reference book:**
  1. "Android Programming: The Big Nerd Ranch Guide" by Bill Phillips, Chris Stewart, and Kristin Marsicano
  2. "iOS Programming: The Big Nerd Ranch Guide" by Christian Keur and Aaron Hillegass

  "Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart" by Alessandro Biessek
- **Web material:**
  1. https://kotlinlang.org/
  2. https://flutter.dev/

- **Software:**
  1. Android Studio
  2. Xcode
  3. Visual Studio

IT348: CRYPTOGRAPHY & NETWORK SECURITY

A. Credit and Hours:

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

B. A. 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'stheorem, 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		

C. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will bediscussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHPetc.
- 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 anappreciation for the concepts being taught in lectures.
- Experiments/Tutorials related to course content will be carried out in the laboratory.

D. Course Outcome (COs):

At the end of the course, the students will be able to

CO1	Know the importance of security and to apply the concepts of techniques and methods to implement security mechanism.
CO2	Learn the different encryption and decryption algorithms using symmetric & asymmetric approach to provide confidentiality.
CO3	Implements the aspects of integrity and authentication, like digital signature andmessage digest, and map them with practical use of it.
CO4	To learn the concepts of web application security, network security and system security for making them immune to attack.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	-	-	-	1	2
CO2	3	3	3	2	3	1	-	-	-	-	-	-	1	1
CO3	2	2	3	2	3	2	-	-	2	1	-	-	1	1
CO4	3	3	3	2	3	-	2	1	2	1	1	2	3	3

Enter correlation levels 1, 2 or 3 as defined below:
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)
If there is no correlation, put "-"

E. Recommended Study Material:

❖ Text Books:

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

❖ Reference Books:

1. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-HillCompanies
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/

IT359: MACHINE LEARNING

A. Credit and Hours:

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

Objective of the Course:

The main objectives for offering the course Machine Learning are:

- To learn about the most effective machine learning techniques and gain practice.
- To able to effectively use the common neural network, 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	15
4.	Unsupervised Learning	10
5.	Reinforcement Learning and applications	11

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

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, Exploratory Data Analysis, Linear Regression, Logistic Regression — **10 Hours 22 %**

2. **Supervised Learning**

   K - Nearest Neighbors, Tree based models(Decision Tree, Random Forest, XGBoost), Support Vector Machines(SVM), Regression evaluation measures (SSE, RMSE, R2 Score), Classification Evaluation measures (Accuracy, Precision, Recall , confusion Metrics, F1-Score), Over fitting and under fitting — **12 Hours 27 %**

3. **Neural Networks and Deep Learning**

	Perceptron Learning, Neural Network Representation, Non-Linear Activation Functions, Cost Function and Back propagation, Training & Validation, Deep Learning introduction and requirement, Hyper parameter tuning, Convolution Neural Nets, Recurrent Neural Nets	**10 Hours**	**22 %**
5.	**Unsupervised Learning** K-Means Clustering, Hierarchical Clustering, Anomaly Detection, Association Rule Learning, Dimensionality Reduction (PCA, SVD)	**08 Hours**	**18%**
6.	**Reinforcement Learning and applications** Reinforcement Learning fundamentals, Q-Learning, Applications of Reinforcement Learning, Machine Learning Applications Across Industries (Healthcare, Retail, Financial Services, Manufacturing, Hospitality) ML offerings AI Startups (Tips, Tricks, Definitions), Introduction to Recommendation Systems	**05 Hours**	**11%**

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, etc.
- Attendance is compulsory in lectures and laboratory.
- Two internal exams will be conducted and average of the same will be converted to equivalent of 20 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 10 Marks as a part of internal theory evaluation.
- Surprise tests/Quizzes/Seminar will be conducted.
- 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. Understand both the statistical and machine learning terminology necessary to create a foundation for understanding the similarity between both the streams.
2. Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised learning.
3. Compare the strengths and weaknesses of many popular Neural Network and Deep learning based machine learning models.

4. Design and evaluate the unsupervised models to solve complex real world problems.
5. Design and develop the solution for recommender system, apply various reinforcement algorithms and apply it to solve real world problems.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	2	-	1	1	-	1	-	1	1	2
CO 2	2	1	-	2	-	-	-	-	-	-	-	-	1	1
CO3	2	-	3	2	2	-	-	-	-	2	-	1	3	2
CO 4	2	3	2	2	-	-	-	-	-	-	-	-	1	1
CO 5	2	3	2	-	2	-	-	-	-	2	-	1	3	2

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

A. Credit and Hours:

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

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Computer Networks and the Internet	03
2.	Application Layer	10
3.	Transport Layer	13
4.	The Network Layer	10
5.	The Link Layer: Links, Access Networks, and LANs	06
6.	Network Management	03
	Total hours (Theory)	45
	Total hours (Lab)	30
	Total hours	75

C. Detailed Syllabus:

1.	**Computer Networks and the Internet**	**03 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**	**10 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**	**13 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**	**10 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**	**06 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**	**03 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 anappreciation for the concepts being taught in lectures.

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

E. Student Learning Outcome:

At the end of the course, the students will be able to

CO1	Analyze layered network architecture and passage of data over communicationlinks
CO2	Analyze delay models in Data Networks using Queueing Systems for messaging and delay sensitive applications
CO3	Design and analyze routing algorithms for Internet and multi-hop autonomousnetworks
CO4	Analyze flow and rate control algorithms between a sender and receiver in widearea networks
CO5	Apply the network fundamentals to analyze performance.
CO6	Use key networking algorithms in simulation.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1	-	-	-	-	-	-	-	2	-
CO2	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO3	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO4	3	3	1	3	1	-	-	-	-	-	-	-	1	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	3	-	-	-	-	-	-	-	-	-

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

IT384 BLOCKCHAIN TECHNOLOGIES
(Elective – II)

A. Credit and Hours:

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

B. Outline of the Course:

Sr No.	Title of the Unit	Minimum number of hours
1.	Introduction to Cryptography and Blockchain	07
2.	Cryptocurrencies	07
3.	Decentralized Applications	14
4.	Hyperledger Fabric	14
5.	Privacy, Security issues and Use Cases of Blockchain	03
	Total hours (Theory)	45
	Total hours (Lab)	30
	Total hours	75

C. Detailed Syllabus:

1. **Introduction to cryptography and Blockchain** **07 hours** **16 %**

   Public Key Cryptography, Hashing, Digital signature, History and Introduction to Blockchain, Types of Blockchain: Private and Public, Permissioned and Permission-less, Distributed Ledger

2. **Cryptocurrencies** **07 hours** **16 %**

   Introduction to crypto primitives and various crypto-currencies, Bitcoin, Bitcoin consensus, Proof of Work, Proof of Stack, Bitcoin Script

3. **Decentralized Applications** **14 hours** **31 %**

Introduction to Ethereum, Smart Contracts, Mining, The consensus problem - Asynchronous Byzantine Models of fault tolerance, Decentralized Applications (Dapps) Platform & Ethereum Client - Geth, Solidity

4.	**Hyperledger Fabric** Introduction to Permissioned Blockchain: Hyperledger Fabric, Microsoft Azure's Blockchain as a Service	**14 hours**	**31 %**
5.	**Privacy, Security issues and Use Cases of Blockchain** Privacy and Security issues in Blockchain like Zero- knowledge proof, double spending, selfish mining, 51% Attacks, potential disruptions with blockchain and other attacks. Use Cases of Blockchain: IOT, HealthCare Sector, Supply-Chain, Land Registry, and other use cases	**03 hours**	**07%**

D. Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will bediscussed.
- Lectures will be conducted with the aid of multi-media projector, black board etc.
- Attendance is compulsory in lectures and laboratory.
- Marks will be given based on continues evaluation, i.e. Unit Tests/Surprise tests/Quizzes/Seminar and Assignments based on course content will be given tothe students at the end of each unit/topic.
- 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. Course Outcome (COs):

At the end of the course, the students will be able to

CO1	To explain the basics of modern cryptography including symmetric key cryptography, public key cryptography, secure hash and digital signature.
CO2	To learn basic concepts of Blockchain & various Cryptocurrencies.
CO3	To learn & implement Ethereum, Smart Contracts & Permissioned Blockchain,hyper ledger.
CO4	To learn Privacy, Security issues in Blockchain & various use cases

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	1	-	1	1	-	-	-	3	3
CO2	3	2	3	3	3	-	-	-	2	-	2	2	3	3
CO3	3	2	3	3	3	-	-	-	2	-	2	2	3	3
CO4	3	3	3	2	3	-	-	-	3	-	3	3	1	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ Text Books:

1. Imran Bashir, "Mastering Blockchain", Packt Second Edition, 2018
2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain by Example", Packt

❖ Reference Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction" , Princeton University Press
2. William Mougayar, Vitalik Buterin, "The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology", Wiley
3. Pethuru Raj Ganesh Chandra Deka, "Blockchain Technology: Platforms, Tools and Use Cases", Elsevier Academic Press
4. Chris Dannen, "Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners", Apress
5. Ghassan Karame, Elli Androulaki, "Bitcoin and Blockchain Security", Artech
6. Sean Stein Smith, "Blockchain, Artificial Intelligence and Financial Services: Implications and Applications for Finance and Accounting Professionals", Springer
7. Rodrigo da Rosa Righi, Antonio Marcos Alberti, Madhusudan Singh, "Blockchain Technology for Industry 4.0: Secure, Decentralized, Distributed and Trusted Industry Environment", Springer

❖ **Reference Links/ e-content:**

1 https://www.coursera.org/learn/blockchain-basics

2 https://nptel.ac.in/courses/106/105/106105184/

3 https://nptel.ac.in/courses/106/104/106104220/

4. https://www.ibm.com/in-en/cloud/blockchain-platform
5. https://medium.com/blockchain
6. https://ieeexplore.ieee.org/search/searchresult.jsp?newsearch=true&queryText=blockchain
7. https://www.springer.com/gp/search?query=blockchain&submit=Submit

A. Credits and Hours:

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

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Introduction and Foundations	05
2.	Digital Image Formation and low-level processing	04
3.	Depth estimation and multi-camera views	03
4.	Feature Extraction, Image Segmentation and Pattern Analysis	10
5.	Shape Representation and Segmentation	07
6.	Hough Transform and Object recognition	07
7.	3D Vision and Motion	05
8.	Applications	04
	Total hours (Theory)	45
	Total hours (Lab)	30
	Total hours	75

C. Detailed Syllabus:

Unit No.	Topics	Teaching Hours
1	Introduction and Foundations Image Processing, Computer Vision and Computer Graphics, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality	5

2	Digital Image Formation and low-level processing Overview and State-of-the-art, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.	4
3	Depth estimation and multi-camera views Perspective, Binocular Stereopsis: Camera and Epipolar Geometry; Homography, Rectification, DLT, RANSAC, 3-D reconstruction framework; Auto-calibration. Apparel.	3
4	Feature Extraction, Image Segmentation and Pattern Analysis Edges - Canny, LOG, DOG; Line detectors (Hough Transform),Corners - Harris and Hessian Affine, Orientation Histogram, SIFT,SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids andGaussian derivative filters, Gabor Filters and DWT,Segmentation: Region Growing, Edge Based approaches tosegmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation; Object detection, Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification:Discriminant Function, Supervised, Un-supervised, Semi-supervised; Classifiers: Bayes, KNN, ANN models; DimensionalityReduction: PCA, LDA, ICA; Non-parametric methods.	10
5	Shape Representation and Segmentation Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis	7
6	Hough Transform and Object recognition Line detection, Hough Transform (HT) for line detection, foot-of-normal method, line localization, line fitting, RANSAC for straight line detection, HT based circular object detection, accurate center location, speed problem, ellipse detection, Case study: Human Iris location, hole detection, generalized Hough Transform (GHT), spatial matched filtering, GHT for ellipse detection, object location, GHT for feature collation, Object Recognition: Simple object recognition methods, Shape correspondence and shape matching, Principal component analysis , Shape priors for recognition.	7

7	3D Vision and Motion Methods for 3D vision, projection schemes, shape from shading, photometric stereo, shape from texture, shape from focus, active range finding, surface representations, point-based representation, volumetric representations, 3D object recognition, 3D reconstruction, introduction to motion, triangulation, bundle adjustment, translational alignment, parametric motion, spline-based motion, optical flow, layered motion.	5
8	Applications Photo album, Face detection, Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance, foreground-background separation, particle filters, Chamfer matching, tracking, and occlusion, combining views from multiple cameras, human gait analysis Application: In-vehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians.	4
	Total	**45**

D. Instructional Method and Pedagogy:

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

E. Student Learning Outcome:

At the end of this course students will be able to:

CO1	Understand image processing techniques for computer vision.
CO2	Understand image formation techniques, extract features from image and do analysis of image.
CO3	Understand shape and region analysis.
CO4	Understand Hough transformation and its application to detect ellipse, line.
CO5	Understand three-dimensional analysis techniques.
CO6	Develop some application using computer vision algorithms.

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	2	3	3	2	-	-	-	-	-	-	-	3	3
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	-	-	3	3	-	-	-	-	-	-	-	3	3
CO6	-	-	3	-	3	-	-	-	-	-	-	-	3	3

F. Recommended Study Material:

❖ **Text book:**

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, PearsonEducation, 2003.

❖ **Reference Books:**

1. 1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, PrenticeHall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. 2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri,Publisher: Prentice Hall.
3. 3. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison WesleyLongman, Inc., 1992.
4. 4. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs,1982.
5. 5. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA).Springer, 2010
6. 6. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle.Thomson.
7. 7. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press,2012
8. 8. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference,Cambridge University Press, 2012
9. 9. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing forComputer Vision, Third Edition, Academic Press, 2012.

❖ **Journals**

1. IEEE-T-PAMI (IEEE Transactions on Pattern Analysis and Machine Intelligence).
2. IJCV (International Journal of Computer Vision) - Springer.

A. Credit and Hours:

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

Objective of the Course:

The main objectives for offering the course are::

- To understand the DevOps Concepts and DevOps Tool for preparing and maintaining the infrastructure (servers) on which the application is deployed.
- To administer a server and install different tools on it.
- To Understand concepts of virtualization and containerization and how to manage containerized applications on a server.
- To integrate new features or bug fixes in the existing application and deployed it for the end user continuously and in an automated way.
- To learn the services of that specific platform and learn how to manage the whole deployment infrastructure on cloud platform.
- To track the performance, discover problems in your infrastructure and the application.
- To understand how systems can collect and aggregate data with the goal of using it to troubleshoot, gain business insights, etc.

B. Outline of the Course:

Sr. No.	Title of the unit	Minimum number of hours
1.	**DevOps: An Overview**	04
2.	OS & Linux Basics	06
3.	Containerization - Docker	07
4.	**CI/CD Pipelines**	04
5.	**Cloud Provider - AWS**	05
6.	**Container Orchestration - Kubernetes**	07
7.	**Monitoring & Observability**	04
8.	**Infrastructure as Code**	04
9.	**Version Control – Git**	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	DevOps: An Overview DevOps: Origins DevOps: Roots Addressing Dev versus Ops DevOps: Practices Continuous Integration Continuous Delivery Supporting Practices &Shift Left Architecture and Risk Mitigation	04 Hours	10%
2.	**OS & Linux Basics** Shell Commands Linux File System & Permissions SSH Key Management Virtualization basics of Networking & Security in order to configure the infrastructure, like Configure Firewalls to secure access, Understand how IP addresses, ports and DNS works, Load Balancers, Proxies, HTTP/HTTPS	06 Hours	14%
3.	**Containerization - Docker** Overview Run containers Inspect active containers Docker Networking Persist data with Docker Volumes Dockerize apps using Docker files Run multiple containers using Docker-Compose Work with Docker Repository	7 Hours	17%
4.	**CI/CD Pipelines** Setting up the CI/CD server pipeline automatically Integrate code repository to trigger Build Tools & Package Manager Tools to execute the tests and package the application Configuring artifact repositories (like Nexus) and integrate with pipeline	4 Hours	8%
5.	**Cloud Provider - AWS** IAM service - managing users and permissions VPC service - your private network EC2 service - virtual servers	5 Hours	10%
6.	**Container Orchestration - Kubernetes** How Kubernetes works How to administer and manage the K8s cluster How to deploy applications on K8s Learn core components like, Deployment, Service, ConfigMap, Secret, StatefulSet, Ingress Kubernetes CLI (Kubectl) Persisting data with K8s Volumes Namespaces	7 Hours	17%
7.	**Monitoring & Observability** Prometheus: A popular monitoring and alerting tool		8%

	Grafana: Analytics and interactive visualization tool ELK Stack: A popular log management stack	4 Hours	
8.	**Infrastructure as Code** Infrastructure provisioning - Terraform Configuration management – Ansible	4 Hours	8%
9.	**Version Control – Git** tracking of changes in the source code and enables better collaboration on code	4 Hours	8%

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:

CO 1	To install and configuring operating system/software requires automating the software development life cycle
CO 2	To run the tests packages the application, build a container Image, push the container Image to an Image repository, deploy the new version to a server
CO 3	To integrate and monitor software throughout the development cycle.
CO 4	To setup software monitoring, setup infrastructure monitoring, e.g. for your Kubernetes cluster and underlying servers visualize the data
CO 5	To use Infrastructure as a code to create and configure infrastructure

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	-	-	-	-	-	-	-	-	-	1	-
CO2	-	2	3	2	-	-	-	-	-	-	-	-	2	3
CO3	-	2	3	2	3	2	-	-	-	-	-	-	1	-
CO4	-	2	3	3	-	3	-	-	-	-	-	-	2	3
CO5	-	-	2	2	3	3	-	-	-	2	2	3	3	3

F. Recommended Study Material:

Text Books:

1. Freeman, E. (2019). DevOps for dummies. John Wiley & Sons.
2. Sharma, S. (2017). The DevOps adoption playbook: a guide to adopting DevOps in a multi-speed IT enterprise. John Wiley & Sons.

Credit and Hours:

Teaching Scheme	Theory	Practical	Project	Total	Credit
Hours/week	0	0	2	2	1
Marks	0	0	50	50	

A. 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

B. 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

C. 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 bythe 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 isdecided 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.

D. Student Learning Outcome:

After the completion of the course students will able to

CO1	Identify a range of solutions, critically evaluate and justify proposed design solution.
CO2	Manage learning & self-development including development of organizational skills, time management, effective use of scientific literature and discriminating use of Web resources.
CO3	Apply a wide range of principles and tools available to the software developer such as choice of the algorithm, language, software libraries etc.
CO4	Write and test programs using appropriate test cases.
CO5	Solve communication issues in large, complex software projects and Structure &communicate ideas effectively orally. Also Prepare & deliver coherent and structured verbal and written technical reports.
CO6	Evaluate system in terms of general quality attributes and possible trade-offs presented within the given problem/system.

Course Articulation Matrix:

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	-	2	2	2	2	-	1	3	3	2
CO2	3	3	1	2	1	2	2	2	2	-	1	3	3	2
CO3	3	1	3	3	3	1	2	2	3	-	2	3	3	2
CO4	3	1	1	3	1	-	-	1	2	-	2	2	2	2
CO5	3	-	-	-	-	-	2	3	3	3	3	2	2	1
CO6	3	2	1	2	1	-	-	1	2	-	1	1	3	1

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial

(High)If there is no correlation, put "-"

E. Recommended Study Material:

❖ **Reference book:**

1. John M Nicolas, Project Management for Business, Engineering and Technology, Elsevier.
2. Sanjay Mohapatra, Software Project Management, Cengage Learning
3. Clive L. Dym, Patrick Little, Elizabeth J. Orwin, "Engineering Design – A Project Based Introduction", Wiley India Pvt. Ltd.
4. B. Hughes & M. Cotterell, "Software Project Management", Tata Mcgraw Hills.

❖ **Web Materials:**

1. https://status.net/templates/project-report/
2. https://www.tutorialspoint.com/software_engineering/software_project_manageme nt.htm
3. https://www.geeksforgeeks.org/coding-standards-and-guidelines/
4. https://www.altexsoft.com/blog/engineering/8-ways-to-improve-software-testing-through-planning-work-environment-automated-testing-and-reporting/
5. https://nptel.ac.in/courses/106/105/106105218/
6. https://www.youtube.com/watch?v=T3q6QcCQZQg
7. https://www.scribbr.com/category/research-paper/

B. Tech. (Information Technology) Programme

SYLLABI

(Semester –8)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

IT447: SOFTWARE PROJECT MAJOR

A. Credit Hours:

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

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 projectwork.
- 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 projectwork.
- 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 formof 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 projectgroup. If in-house project then no group is allowed.
c) The students are required to identify their problem and they are required tofollow 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 thedetails 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 addsubstantial value to the previously done work on the project.
11. The project should be novel, original and having a possibility of good impact if theproposed 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 LevelSource code, If any Hardware platformSoftware Tools Security Measures Quality Assurance Audit ability

1. Test Date and Result

E. Student Learning Outcome:

At the end of the course, the students will be able to

CO1	Explore the new ideas & the possible areas to work ahead.
CO2	Use the various methodologies useful for doing project work.
CO3	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.
CO4	Apply the concepts and theories learnt in previous years of study and work placements

Course Articulation Matrix:

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CO3	3	2	2	-	2	-	-	-	-	-	-	-	3	1
CO4	3	-	-	-	1	-	-	-	-	-	-	-	2	-

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

If there is no correlation, put "-"

F. Recommended Study Material:

❖ Web Link:

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