CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

ACADEMIC REGULATIONS & SYLLABUS

Faculty of Technology & Engineering

Bachelor of Technology Programme
(Computer Science & Engineering)

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 including M.Phil. These faculties, in all offer 32 different programmes. A quick glimpse in as under:

Faculty	Institute	Programmes Offered
Faculty of Technology & Engineering	Charotar Institute of Technology	B. Tech M. Tech Ph. D
Faculty of Pharmacy	Ramanbhai Patel College of Pharmacy	B. Pharm M. Pharm Ph. D PGDCT/ PGDPT
Faculty of Management Studies	Indukaka Ipcowala Institute of Management	M.B.A PGDM Ph.D Dual Degree BBA+MBA
Faculty of Computer Applications	Smt. Chandaben Mohanbhai Patel Institute of Computer Applications	M.C.A/MCA (Lateral) M.Sc IT Ph. D Dual Degree BCA+MCA

Faculty of Applied Sciences	P.D.Patel Institute of Applied Sciences	M.Sc M.Phil Ph.D Dual Degree B.Sc+M.Sc
Faculty of Medical Sciences	Ashok and Rita Institute of Physiotherapy Manikaka Topawala Institute of Nursing Charotar Institute of Paramedical Sciences	B.PT M.PT Ph.D B.Sc (Nursing) M.Sc GNM Ph.D PGDHA

The development and growth of the institutes have already led to an investment of over Rs.80 crores (INR 800 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 350 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 have been the foundation of ECC continue 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-centred, 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

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY

Faculty of Technology and Engineering

ACADEMIC REGULATIONS

Bachelor of Technology (Computer Engineering) Programme

Charotar University of Science and Technology (CHARUSAT)
CHARUSAT Campus, At Post: Changa – 388421, Taluka: Petlad, District: Anand
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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 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;
9.1.4. **In addition to above, the student has to complete the required formalities as per the regulatory bodies, if any.**

9.2 The student who fails to satisfy minimum requirement of CGPA 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 Programmed Educational Objectives (PEOs)

Program Objective 1

To have up-to-date curricula of all the academic programs to meet the diverse and changing global industrial and societal needs, the various challenges and opportunities for the benefit of the students.

Program Objective 2

To have unique industry-oriented programs in collaboration with leading firms of the IT industry.

Program Objective 3

To develop and hone students' technical and behavioral competencies through appropriate pedagogical engagement regularly.

Program Objective 4

To foster student-faculty interaction programs for better understanding and appreciation of their mutual issues and evolving meaningful and appropriate mechanisms for effective learning by students.

Program Objective 5

To develop the professional competencies of faculty members and technical support staff.

Program Objective 6

To create an ambience where the students are cared for in every aspect and motivated to become excellent professionals who will continue to cherish their association with the faculty, staff and co-students.

Program Objective 7

To enhance Knowledge, skill and attitude.

Program Objective 8

To facilitate the development and evaluation of curricula**.**

The Course Outcome (COs)

1. The students will be able to understand the basics and fundamental concepts of Engineering, Mathematics and Applications of Science.
2. The Students will be having the in-depth knowledge of core subjects like programming, algorithm analysis, database, data structure, networking, application development, data mining, compilers, operating systems, web technologies, security etc.
3. The students will be having good presentation skills of their project and topics.
4. The students will be able to do better research and technical/technological things
5. Better performance in all kinds of examinations.
6. Satisfaction level of all the stake holders.
7. To improve the learning and skills of current students in all the fields.
8. At the End of course based on the feedback to improve learning of next group of students or to meet accountability demands.
9. To satisfy stakeholders external to subject or programme.
10. Reorient the course program to improve student learning results.
11. Assessment of the course to be made more adaptive.

The Programme Outcomes (POs)

1. Students with desirable knowledge, skills, positive attitude and professional behavior
2. Sharpening students aptitude, as required by the professional standards of excellence
3. Exposure of the graduates to the latest knowledge and skills, with practical hands-on experience
4. Industry-ready professional with a strong focus on delivering results according to the industry need and expectation
5. To enhance the employability and get right talent into the program
6. To revise course program to improve students' learning needs and curricula development, based on needs of society in general
7. Learning from international as well as domestic institutions and experts as they illustrate the best practices in their fields
8. Conductive to learning environment
9. To create and sustain the interest of the stakeholders in terms of Research, Quality Publications and Mobilization of the Resources
10. To increase and sustain the interest of the students and staff in professional society and its chapter related activities

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY (Effective from CHARUSAT 2013 Batch)											
TEACHING & EXAMINATION SCHEME FOR B TECH PROGRAMME IN COMPUTER ENGINEERING											
Sem	Course Code	Course Title	Teaching Scheme				Examination Scheme				
			Contact Hours.			Credit	Theory		Practical		Total
			Theory	Practical	Total		Internal	External	Internal	External	
Final Year Sem-3	MA245	Discrete Mathematics	4	0	4	4	30	70	0	0	100
	CE251	Java Programming	3	4	7	5	30	70	50	50	200
	CE252	Digital Electronics	3	2	5	4	30	70	25	25	150
	CE253	Data Communication & Networking	3	2	5	4	30	70	25	25	150
	XXXXX	University Elective - I	2			2	-	-	30	70	100
	CE244	Software Group Project-I	0	4	4	2	-	-	50	50	100
	HSXXX	HSS Elective-II	2	0	2	2					100
			17	12	29	23	120	280	180	220	900
Final Year Sem-4	CE245	Data Structures & Algorithms	3	2	5	4	30	70	25	25	150
	CE246	Database Management System	4	4	8	6	30	70	50	50	200
	CE247	Web Technologies	2	4	6	4	30	70	50	50	200
	CE248	Operating System	3	2	5	4	30	70	25	25	150
	CE256	Computer Organization	3	0	3	3	30	70	0	0	100
	XXXXX	University Elective - II	2			2	-	-	30	70	100
	CE255	Software Group Project-II	0	4	4	2	-	-	50	50	100
	HSXXX	HSS Elective - III	2	0	2	2					100
			19	16	35	27	150	350	230	270	1100

List of University Electives			
Code	**University Elective - I (UE - I)**	**Code**	**University Elective - II (UE - II)**
EC281.01	Introduction to MATLAB Programming	EC282.01	Prototyping Electronics with Arduino
CE281.01	Art of Programming	CE282.01	Web Designing
CL281.01	Environmental Sustainability and Climate Change	CL282.01	Basics of Environmental Impact Assessment
EE286	Python for Electrical Engineering	EE283	Computer Programming for Electrical Engineering
IT281.01	ICT Resources and Multimedia	IT282.01	Internet Technology and Web Design
ME281.01	Engineering Drawing	ME282.01	Material Science
PH233	Fundamentals of Packaging	PH238	Cosmetics in daily life
PD260	Basic Laboratory Techniques	NR261	Life Style Diseases & Management
NR251	First Aid & Life Support	PT192	Occupational Health & Ergonomics
PT191	Health Promotion and Fitness	CA225	Programming the Internet
CA224	Introduction to Web Designing	BM241	Health Care Management
BM231	Banking and Insurance		

Table of Contents

MA245: Discrete Mathematics 18
CE251:Java Programming 23
CE252:Digital Electronics 28
CE253:Data Communication & Networking 32
CE244:Software Group Project-I 37
CE245:Data Structure & Algorithm 41
CE246:Database Management System 46
CE247:Web Technologies 51
CE248:Operating System 55
CE250:Software Group Project-I 59

B. Tech. (Computer Engineering) 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

FACULTY OF TECHNOLOGY & ENGINEERING
U & P U. PATEL DEPARTMENT OF COMPUTER ENGINEERING

CE251: JAVA PROGRAMMING

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	4	_	7	**5**
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,

- Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
- Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms
- Have the ability to write a computer program to solve specified problems.
- Analyze a software development problem and express its essence succinctly and precisely;
- Design a module structure to solve a problem, and evaluate alternatives;

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1.	Fundamental of Programming in Java	02
2.	Class Fundamentals	04
3.	Array & String Handling	02
4.	Inheritance, Interfaces & Packages	06
5.	Exceptions Handling	05
6.	Multithreaded Programming	07

7.	File I/O and NIO	07
8.	Java Collection Frameworks and Generics	12

Total hours (Theory): 45

Total hours (Lab): 60

Total hours: 120

C. Detailed Syllabus:

1.	**Fundamental of Programming in Java**	**02 Hour**	**04 %**
1.1	History of Java		
1.2	Basic overview of java, Bytecode, JVM		
1.3	Buzz-words		
1.4	Application and applets		
1.5	Constants, Variables & Data Types, Comment		
1.6	Operators, Control Flow		
2.	**Class Fundamentals**	**04 Hour**	**09 %**
2.1	General form of class, Creating class Overloading methods		
2.2	Constructor ,Declaring Object, Returning objects, using objects as parameters,		
2.3	Assigning object reference variables		
2.4	Introducing Access control , Understanding static		
2.5	Introducing final, The finalize ( ) method		
2.6	The this keyword ,Garbage collection		
3.	**Array & String Handling**	**02 Hours**	**04 %**
3.1	Array basics, String Array, String class		
3.2	StringBuffer and StringBuilder class		
3.3	String Tokenizer Class and Object Class		
4.	**Inheritance, Interfaces & Packages**	**06 Hours**	**13 %**
4.1	Inheritance: Using super creating multilevel Hierarchy		
4.2	method overriding, Dynamic method dispatch		
4.3	abstract classes, Using final with Inheritance		

4.4	Using Package: Defining package		
4.5	Finding package and CLASSPATH		
4.6	Access protection, Importing package		
4.7	Interface: Defining Interface, Default Methods		
4.8	Implementing Interface, Variables in Interface		
5.	**Exceptions Handling**	**05 Hours**	**11 %**
5.1	Exception types		
5.2	Try …Catch…Finally, Throw, Throws		
5.3	creating your own exception subclasses		
6.	**Multithreaded Programming**	**07 Hours**	**16 %**
6.1	Life cycle of thread		
6.2	thread methods, thread priority		
6.3	thread exceptions		
6.4	Implementing Runnable interface		
6.5	Synchronization and Concurrency		
7.	**File NIO**	**07 Hours**	**16 %**
7.1	File and Directories		
7.2	Byte streams and character streams, Random Access Files		
7.3	NIO: Meta Data File Attributes Buffers, Channels, Recursive Operation.		
8.	**Collection Framework and Generics**	**12 Hours**	**27 %**
8.1	Collections of objects		
8.2	Collections: Sets, Sequence, Map		
8.3	Understanding Hashing		
8.4	Use of Array List & Vector		
8.5	Generics Class, Lamda Expression, Functional Reference, Method Reference, Optional Classes, Processing data with streams		

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 Outcomes:

By taking this course Programming in Java,

- Students will be able to use different commands of JDK.
- Student will able implement GUI as well as multithreaded programming for real life projects.
- Students are 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. Java: The Complete Reference, Ninth Edition by Herbert Schildt , Oracle Press.
2. Java 8 in Action: Lambdas, Streams, and Functional-style Programming by Alan Mycroft and Mario Fusco, Manning Publication

❖ **Reference Books:**

1. Thinking in Java, Bruce Eckel, Prentice Hall

2. Java: A Beginner's Guide (Sixth Edition) by Herbert Schildt , Oracle Press.
3. Core Java Volume I--Fundamentals (9th Edition) (Core Series) by Cay S. Horstmann, Prentice Hall

❖ **Web Materials:**

1. www.java.sun.com
2. www.javaarchives.com
3. www.freewarejava.com
4. www.codeguru.com

FACULTY OF TECHNOLOGY & ENGINEERING
U & P U. PATEL DEPARTMENT OF COMPUTER ENGINEERING

CE252: DIGITAL ELECTRONICS

Credits and Hours:

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

A. Objective of the Course:

Main aim of the course is to teach the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

The objective of the course is,

- To introduce number systems and codes, basic postulates of Boolean algebra and shows the correlation between Boolean expressions.
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits and to introduce the concept of memories and programmable logic devices.
- To understand basic working of computer, computer architecture and the course is a base for subject like microprocessor and advanced microprocessor.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Number Systems	5
2	Boolean Algebra and Logic Gates	5
3	Simplification of Boolean Functions	6
4	Combinational Logic	5
5	Combinational Logic With MSI AND LSI	5
6	Sequential Logic	10

7	Registers, Counters and the Memory Unit	5
8	Processor Logic Design	4

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Number Systems**	**05 Hours**	**12%**
1.1	Digital computer and digital systems, Binary Number, Number base conversion Octal and Hexadecimal Number		
1.2	Complements, Binary Codes		
1.3	Binary Storage and register, Binary Logic, Integrated Circuit		
2.	**Boolean Algebra and Logic Gates**	**05 Hours**	**10%**
2.1	Basic Definition, Axiomatic Definition of Boolean Algebra, Minterm And Maxterms		
2.2.	Basic Theorem and Properties of Boolean Algebra		
2.3	Logic Operations, Digital Logic Gates, IC digital Logic Families		
3.	**Simplification of Boolean Functions**	**06 Hours**	**15%**
3.1	Two-Three Variable K-map, Four- Five Variable K-map		
3.2	Product of sum Simplification, NAND or NOR implementation		
3.3	Don't Care condition		
3.4	Tabulation method		
4.	**Combinational Logic**	**05 Hours**	**10%**
4.1	Introduction, Design Procedure, Hazards		
4.2	Adder, subtractor		
4.3	Code Conversion, Universal Gate, exclusive OR & equivalence functions		
5.	**Combinational Logic With MSI and LSI**	**05 Hours**	**10%**
5.1	Introduction, Binary Parallel Adder		
5.2	Decimal Adder, Magnitude Comparator		
5.3	Decoder, Multiplexer		

5.4	ROM, PLA, PAL		
6.	**Sequential Logic**	**10 Hours**	**20%**
6.1	Introduction, RS,JK,D,T Flip-Flops, Triggering of Flip-Flops		
6.2	Flip-Flop Excitation Tables, Analysis of Clocked Sequential Circuits		
6.3	State Reduction and Assignment Design Procedure		
6.4	Design of Counters, Design with State Equations		
7.	**Registers, Counters and the Memory unit**	**05 Hours**	**13%**
7.1	Introduction, Registers, Shift Registers		
7.2	Ripple Counters, Synchronous Counters		
7.3	Timing Sequences, Memory Unit, Johnson counter		
8.	**Processor Logic Design**	**04 Hours**	**10%**
8.1	Processor Organization		
8.2	Arithmetic Logic Unit, Design of ALU		
8.3	Status Register		
8.4	Design of Shifter		
8.5	Processor Unit		

D. Instructional Method and Pedagogy:

- Multimedia Projector
- OHP
- Audio Visual Presentations
- Chalk + Board
- White Board
- Online Demo
- Charts

E. Student Learning Outcomes:

- Able to Design combinational circuits on bread board
- Able to design different flip-flops
- Able to simulate on VHDL software

F. Recommended Study Material:

- **Text Books:**
  1. Digital Logic and Computer Design By M Morris Mano, PHI- Publication 2002
  2. Digital Principles and Application by Malvino & Leach, THI-1999
- **Web Materials:**
  1. http://zebu.uoregon.edu/~rayfrey/432/DigitalNotes.pdf
  2. http://smendes.com/el10b/gates1.gif
- **Other Materials:**
  1. Lab Manuals
  2. Hand Outs
  3. Assignment

CE253: DATA COMMUNICATION & NETWORKING

Credits and Hours:

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

A. Objective of the Course:

This course will allow students to develop background knowledge as well as core expertise in data communications and networking, which is one of the fastest growing technologies.

The main objective of the course is:

- To make them familiar with basic need of communication and networking.
- To understand the fundamental concepts of communication and networking.
- To learn the basic elements of data communication system and describe communication protocols and data transmission modes.
- To identify different types of network topology.
- To understand types of network like LAN, WAN, MAN and its uses in modern communication.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction and Basic Concepts	02
2	The OSI Model	02
3	Signals	04
4	Encoding And Modulation	06
5	Data Transmission	07
6	Multiplexing	08
7	Error Correction and Detection	05
8	Data Link Control	05

9	Local Area Networks	03
10	Switching	03

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction and Basic Concepts**	**02 Hours**	**04%**
1.1	Why to study data communication?		
1.2	Data Communication		
1.3	Networks		
1.4	Protocols and Standards		
1.5	Standards Organizations		
2.	**The OSI Model**	**02 Hours**	**04%**
2.1	The Model		
2.2	Functions of the layers		
2.3	TCP/IP Protocol Suites		
3.	**Signals**	**04 Hours**	**11%**
3.1	Analog and Digital		
3.2	Periodic and A periodic Signals		
3.3	Analog Signals		
3.4	Time and Frequency Domains		
3.5	Composite Signals		
3.6	Digital Signals		
4.	**Encoding And Modulation**	**06 Hours**	**14%**
4.1	Digital to Digital Conversion		
4.2	Analog to Digital Conversion		
4.3	Digital to Analog Conversion		
4.4	Analog to Analog Conversion		
5.	**Data Transmission and Transmission Media**	**07 Hours**	**18 %**
5.1	Digital data transmission		

5.2	DTE-DCE Interface		
5.3	Modems		
5.4	56K Modems		
5.4	Cable Modems		
5.5	Guided Media		
5.6	Unguided Media		
5.7	Transmission Impairments		
5.8	Performance Wavelength		
5.9	Shannon Capacity		
5.10	Media Comparison		
5.11	PSTN		
5.12	Switching		
6.	**Multiplexing**	**08 Hours**	**14%**
6.1	Many to one/one to Many		
6.2	Frequency division Multiplexing		
6.3	Wage division Multiplexing		
6.4	Time division Multiplexing		
6.5	Multiplexing applications		
7.	**Error Correction and Detection**	**05 Hours**	**09 %**
7.1	Types of Errors		
7.2	Detection, Parity Check		
7.3	Vertical Redundancy Check		
7.4	Longitudinal Redundancy Check		
7.5	Cyclic Redundancy Check		
7.6	Checksum		
7.7	Error Correction		
8.	**Data Link Control**	**05 Hours**	**09%**
8.1	Line Discipline		
8.2	Flow Control		
8.3	Error Control		
9.	**Local Area Networks**	**03 Hours**	**04%**

9.1	802		
9.2	Ethernet		
9.3	Other Ethernet Networks		
9.4	Token Bus		
9.5	Token Ring		
9.6	FDDI		
10.	**Switching**	**03 Hours**	**07%**
10.1	Circuit Switching		
10.2	Packet Switching		

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 works.
- 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 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 Outcomes:

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

- Students will able to design and develop the communication network for any organization.
- Students will be able to troubleshoot any network problem.
- Student will be able to select appropriate devices to design new network for any organization.

F. Recommended Study Material:

❖ **Text Books:**

1. Data communication & Networking, Bahrouz Forouzan, McGraw-Hill

❖ **Reference Books:**

1. Data and Computer Communications, William Stallings, Prentice Hall
2. Computer Network, Andrew S. Tanenbaum, Fourth Edition, Prentice Hall

❖ **Reference Books:**

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

CE244: SOFTWARE GROUP PROJECT -1

Credits and Hours:

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

A. Objective of the Course:

- To sustain competitive advantage among the students by acquiring domain skills with the help of different technologies.
- To create enhanced employment by moulding the students with higher technical skill.
- To promote creative thinking, to provide hands on actual technology.
- Able to handle software project and get use to software development processes.

B. Outline of the Courses:

- Student at the beginning of a semester may be advised by his/her supervisor (s) for recommended courses.
- Students will work together in a team (at most ***three***) with any programming language.
- 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. Final Project Report
b. Project Setup file with Source code
c. Project Presentation (PPT)

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

Total hours (Theory): 00

Total hours (Lab): 30

Total hours: 30

C. Instructional Method and Pedagogy:

- Students will select related topic based on subjects they learnt and other literatures like books, periodicals, journals and various internet resources.
- Students can select the topic based on the research areas of available supervisor.
- Each student has to prepare a Final Report in prescribed format only. The report typed on A4 sized sheets and bound should be submitted after approval by the supervisor/guide and endorsement of the Head of Department.
- Performance of students at the Project will be assessed by the department faculty. The supervisor/guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the project.

D. Student Learning Outcomes:

After the completion of the course students will able to

- Explore the new ideas & the possible areas to work ahead.
- Able to use the various methodologies useful for doing project work.
- Apply the concepts and theories learnt in previous years of study and work placements.
- They can apply their theoretical knowledge in the development of project.

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 Materials:**

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

B. Tech. (Computer Engineering) Programme

SYLLABI

(Semester – 4)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

CE245: DATA STRUCTURES & ALGORITHMS

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	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 etc. To provide an in-depth knowledge in problem solving techniques and data structures.

The main objective to give the course is:

- To teach the students how to select and design data structures and algorithms, how Data structure stores data in a computer efficiently and how to compute algorithms' complexity.
- This course offers the students a mixture of theoretical knowledge and applicability of data structures in real life.
- This course will be the basis for the higher semester subject like Algorithm Analysis and Design.

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	12
3	Non Linear Data Structure	16

4	Sorting	10
5	Searching	01
6	Dictionaries	02

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction**	**04 Hours**	**08%**
1.1	Introduction to data structure (Types of data structure)		
1.2	Introduction to algorithms. Algorithm Analysis and Big O notation		
1.3	Memory representation of Array: Row Order and Column Order, Sparse Matrices and their representations.		
1.4	Abstract Data Types(ADT)		
2.	**Linear Data Structure**	**12 Hours**	**27%**
2.1	**Stack:** Operations: push, pop, peep, change, Applications of Stack: Recursion: Recursive Function Tracing, Principles of recursion, Tail recursion, Removal of Recursion, Tower of Hanoi, Conversion: Infix to Postfix, Infix to Prefix. Evaluation : Prefix and Postfix expression		
2.2	**Queue** Simple Queue : Insert and Delete operation, Circular Queue : Insert and Delete operation Concepts of : Priority Queue, Double-ended Queue, Applications of Queue		
2.3	**Linked List:** Memory Representation of LL, Singly Linked List, Doubly Linked List ,Circular Linked List ,Applications of Linked List		
3.	**Non Linear Data Structure**	**16 Hours**	**36%**
3.1	**Tree** :Tree Concepts , Tree Traversal Techniques: Pre-order, Post-order and In-order (Recursive and Iterative) ,Binary Search Tree: Iterative and Recursive, Threaded Binary Tree, Balanced Trees(AVL		

	Trees, Splay Trees, Union-Find Trees, Red-Black Trees), Tries and pattern matching, Applications of Tree.		
3.2	**Heaps :** priority queues and Binary Heaps, Treaps		
3.3	**Graph:** Graph concepts, Memory Representation of Graph, BFS and DFS, Graph Coloring Problem, Spanning trees: Prim's and Kruskal's algorithm and union find data structure. Dijkstra's algorithm for shortest path. Shortest path tree. Shortest and longest paths in directed acyclic graphs. Applications of Graph		
4.	**Sorting**	**10 Hours**	**23%**
4.1	Sorting (concepts, Selection Sort, Bubble Sort, Merge Sort, Tree Sort, Radix Sort, Insertion Sort, Heap Sort, Quick Sort, Shell Sort, Counting Sort, Topological Sort)		
5.	**Searching**	**01 Hour**	**02%**
5.1	Sequential Search, Binary Search		
6.	**Dictionaries**	**02 Hours**	**04%**
6.1	Skip-lists, Hashing ,Hashing Functions, Collision-Resolution Techniques, Applications		

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 Outcomes:

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

- Student will be able to synthesize efficient algorithms in common engineering design situations.
- Students will be able to select and use appropriate data structures that efficiently address program requirements.
- Students will be able to gain insight knowledge and applicability of data structure in real life.

F. Recommended Study Material:

❖ **Text Books:**

1. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G. Sorenson, McGraw-Hill.
2. Data structure with C, Lipschutz, TMH.
3. Introduction to Algorithms: Cormen, Leiserson, Rivest and Stein: Prentice Hall of India
4. Data Structures and Algorithms: Aho, Hopcroft and Ullmann: Addison Wesley.

❖ **Reference Books:**

1. Classic Data structures, D.Samanta, Prentice-Hall International.0
2. Data Structures using C & C++, Ten Baum, Prentice-Hall International.

3. Data Structures: A Pseudo-code approach with C, Gilberg & Forouzan, Thomson Learning.
4. Fundamentals of Data Structures in C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, W. H. Freeman.
5. "A Practical Introduction to Data Structures and Algorithm Analysis" by Clifford A. Shaffer
6. Data Structures and Algorithm in Java: Goodrich and Tamassia: John Wiley and Sons.

❖ **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

CE246: DATABASE MANAGEMENT SYSTEM

Credits and Hours:

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

A. Objective of the Course:

Databases are store house or repository for organizational information. Storing and efficient usage 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 Web Technology are:

- To understand the overall structure and design of DBMS (software).
- To cover three major aspects of data: relation, integrity, and security.
- How to efficiently store and retrieve the data from database.
- To give the motivations behind development of DBMS, relational database design And SQL (Structured Query Language) used with relational databases.
- To provide students with the background knowledge to design, implement, and use database Management systems.
- 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	04
2	Relational Model	06
3	Entity-Relationship model	07
4	Formal Relational Query Languages	06
5	Relational Database Design	09

6	Transaction & Recovery Management	07
7	Advanced Transaction Processing	06
8	Database Security	06
9	Indexing and Hashing	07
10	Query Processing & Query Optimization	02

Total hours (Theory): 60

Total hours (Lab): 60

Total hours: 120

C. Detailed Syllabus:

1.	**Introductory concepts of DBMS**	**04 Hours**	**06%**
1.1	Introduction and applications of DBMS		
1.2	Purpose of database		
1.3	Data Independence		
1.4	Database System architecture- levels		
1.5	Mappings		
1.6	Database users and DBA		
2.	**Relational Model**	**06 Hours**	**10%**
2.1	Structure of Relational Databases, Database Schema, Schema Diagram		
2.2	Domains , Relations		
2.3	Relational Query Languages		
2.4	Relational Operations		
3.	**Entity-Relationship model**	**07 Hours**	**12%**
3.1	Basic concepts		
3.2	Design process		
3.3	Constraints		
3.4	Keys		
3.5	Design issues		
3.6	E-R diagrams		
3.7	Weak Entity Sets		

3.8	Extended E-R features- Generalization, Specialization, Aggregation		
3.9	Reduction to E-R database schema		
4.	**Formal Relational Query Languages**	**06 Hours**	**10%**
4.1	The relational Algebra		
4.2	The Tuple Relational Calculus		
4.3	The Domain Relational Calculus		
5.	**Relational Database design**	**09 Hours**	**15%**
5.1	Functional Dependency–definition		
5.2	Trivial and Non-Trivial FD		
5.3	Closure of FD set		
5.4	Closure of attributes		
5.5	Irreducible set of FD		
5.6	Normalization – 1NF, 2NF,3NF		
5.7	Decomposition using FD- Dependency Preservation		
6.	**Transaction & Recovery Management**	**07 Hours**	**12%**
6.1	Transaction concepts, Properties of Transactions		
6.2	Serializability of transactions, Testing for Serializability		
6.3	System recovery, Two- Phase Commit protocol, Recovery and Atomicity		
6.4	Log-based recovery, Concurrent executions of transactions and related problems, Locking mechanism		
6.5	Solution to Concurrency Related Problems, Deadlock, Two-phase locking protocol, Intent locking		
7.	**Advanced Transaction Processing**	**06 Hours**	**10%**
7.1	Transaction-Processing Monitors		
7.2	Transactional Workflows		
7.3	Main-Memory Databases		
7.4	Real-Time Transaction Systems		
7.5	Long-Duration Transactions		
8.	**Database Security**	**06 Hours**	**10%**

8.1	Views - What are views for? , View retrievals, View updates, Snapshots (a digression), Materialized view.		
8.2	Security – Security and Authentication, authorization in SQL,		
8.3	Data encryption		
8.4	Missing Information - An overview of the 3VL approach		
9.	**Indexing and Hashing**	**07 Hours**	**12%**
9.1	Basic Concepts		
9.2	Ordered Indices, B+-Tree Index Files, B+-Tree Extensions		
9.3	Multiple-Key Access, Static Hashing, Dynamic Hashing		
9.4	Comparison of Ordered Indexing and Hashing, Bitmap Indices		
9.5	Index Definition in SQL		
10	**Query Processing & Query Optimization**	**02 Hours**	**03%**
10.1	Overview, Measures of Query Cost		
10.2	Selection Operation, Sorting, Join		
10.3	Evaluation of Expressions		
10.4	Transformation of relational Expressions		
10.5	Estimating Statistics of expression results		
10.6	Query Evaluation plans		

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 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 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 Outcomes:

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

- Students will be able to translate written business requirements into conceptual entity-relationship data models.
- Students will be able to analyze business requirements and produce a viable model
- Students will be able to convert conceptual data models into relational database schemas using the SQL Data Definition Language (DDL).
- Student will be 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:**

1. "Fundamentals of Database Systems", R. Elmasri and S.B. Navathe, the Benjamin / Cumming Pub. Co
2. SQL,PL/SQL the Programming Language of oracle, Ivan Bayross, BPB Publications
3. Oracle: The Complete Reference, George Koch, Kevin Loney, TMH /oracle press

❖ **Web Materials:**

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

CE247: WEB TECHNOLOGIES

Credits 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 Programming are:

- To introduce various Web Server Protocol and Web Architecture.
- To have hands on experience for HTML4/5, CSS2/3 and JavaScript including JavaScript Framework such as Jquery,AngularJS, and Server Side Scripting language(PHP) these will help them to learn web designing and web development.

B. Outline of the course:

Sr. No.	Title of the Unit	Minimum number of hours
1.	Introduction to WWW	01
2.	HTML 4.0	02
3.	HTML5.0	02
4.	Cascading Style Sheet 2.0	02
5.	Cascading Style Sheet 3.0	03
6.	Client side Scripting Language (JavaScript)	05
7.	DOM (Document Object Model)	03
8.	JavaScript Framework (Jquery, AngularJS)	08
9.	Basics of PHP	04

Total hours (Theory): 30

Total hours (Lab): 60

Total hours: 90

C. Detailed Syllabus:

1.	**Introduction to WWW** Introduction of Web1.0/Web2.0/3.0, URL, URI, URN, DNS Client/Server Model, Protocols – TCP/IP, HTTP/HTTPS, SMTP, POP3, MIME, IMAP. Website vs. Portal vs. Blog vs. Forum, HTTP Request/Response Header.	**01 Hours**	**03%**
2.	**HTML4.0** Introduction of HTML, Headings, Comment, Paragraphs, Formatting, Fonts, Links, Images, Tables, Lists, Forms.	**02 Hours**	**07%**
3.	**HTML5.0** Introducing HTML5, Structural and Semantics Elements, Input types, Form Elements and Attributes, Rich Media: Audio, Video, Canvas and SVG. HTML5 APIs: Geolocation, Drag/Drop, Web Storage, App Cache, Web Workers.	**02 Hours**	**07%**
4.	**Cascading Style Sheet 2.0** CSS Introduction, Types of CSS, CSS Id & Class, CSS Box Model ,CSS Properties: Background, Text, Fonts, Links, Lists, Tables, Positioning, Display, Dimension, Floating, Pseudo-class, Pseudo-element, Image Opacity.	**02 Hours**	**07%**
5	**Cascading Style Sheet 3.0** Introducing CSS3, Selectors, Pseudo-classes and Pseudo-elements Borders and Box Effects, Background Images and Other Decorative Properties, Text Effects and Typographic Styles, Web Fonts, 2D Transforms, 3D Transforms, Transitions and Animations, Multiple Columns, User Interface, Flexible Box Layout and Grid Layout.	**03 Hours**	**10%**
6.	**Client side Scripting Language(JavaScript)** Introduction to JavaScript, Data Types and Variables, Type Conversion, Operators, Decisions, Loops and Functions, Array, Common Mistakes, Debugging and Error Handling, Programming the Browser, Events, HTML Forms: Interacting with User, String Manipulation, Date, Time and Timers, Storing Information:	**05 Hours**	**17%**

Cookies.

7.	**DOM (Document Object Model)** DOM Tree, Descending with Child Nodes, Ascending with Child Nodes, Finding an Element by ID, Tag Name and Class, Creating Element, Deleting and Copying Content. Working with DMO: Dynamic Scripts, Dynamic Styles, Manipulating Tables.	**03 Hours**	**10%**
8.	**JavaScript Framework** JQuery: jQuery core, Selectors, Attributes, Events, Effects and jQuery UI. AngularJS: Modules, Directives, Controller, Data Bindidings,Scopes, Filter,Table, SQL,Event	**08 Hours**	**27%**
9.	**Basics of PHP** Overview of PHP, Environment Setup, PHP: Array, String, MySql with PHP	**04 Hours**	**12%**

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 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 Outcomes:

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 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. HTML 5 and CSS 3.0 to the Real World by Alexis Goldstein, Sitepoint publication.
2. Beginning JavaScript – 4th Edition by Paul Wilton, Jeremy McPeak, Wrox Publication.
3. Learning JQuery Third Edition, Jonathan Chaffer Karl Swedberg, Packt Publishing.
4. AngularJS O'Reilly, by Shyam Seshadri

❖ **Reference Books:**

1. Learning Web Design by Jennifer Niederst Robbins, 3rd Edition, O'Reilly.
2. HTML5 Web Application Development by Example by J.M Gustafson.
3. Programming HTML5 Application by Zacbary Kessin, O'Reilly
4. JavaScript Bible, Gold Edition by Danny Goodman.
5. JavaScript for Absolute Beginners by Terry McNavage. Apress publication.
6. CSS Cook book By Christopher Schmitt, O'Reilly publication.
7. JQuery Cookbook, O'Reilly Media by Cody Lindley.

❖ **Web Materials:**

1. www.w3schools.com
2. www.tutorialspoint.com
3. www.tizag.com

CE248: OPERATING SYSTEM

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	2	0	5	4
Marks	100	50	0	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	02
2	Process Management	04
3	Inter process Communication	08
4	Deadlock	06
5	Memory Management	08
6	Input Output Management	07
7	File Systems	06
8	Unix/Linux File System	04

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

C. Detailed Syllabus:

1.	**Introduction**	**02 Hours**	**05%**
1.1	What is an OS? Evolution Of OS		
1.2	OS Services		
1.3	Types Of OS		
1.4	Concepts of OS		
1.5	Different Views Of OS		
2.	**Process Management**	**04 Hours**	**08%**
2.1	Process, Process Control Block, Process States,		
2.2	Threads, Types of Threads and Dispatching, Concurrent Threads		
3.	**Inter process Communication**	**08 Hours**	**15%**
3.1	Race Conditions, Critical Section, Co-operating Thread/ Mutual Exclusion		
3.2	Hardware Solution, Strict Alternation, Peterson's Solution		
3.3	The Producer Consumer Problem, Semaphores, Event Counters, Monitors		
3.4	Message Passing and Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem.		
4.	**Deadlock**	**06 Hours**	**15%**
4.1	Deadlock Problem, Deadlock Characterization		
4.2	Deadlock Detection, Deadlock recovery		
4.3	Deadlock avoidance: Banker's algorithm for single & multiple resources		
4.4	Deadlock Prevention.		
4.5	CPU Scheduling, Protection : Address space, Address Translation		
5.	**Memory Management**	**08 Hours**	**18%**
5.1	Paging: Principle Of Operation, Page Allocation, H/W Support For Paging		

5.2	Multiprogramming With Fixed partitions		
5.3	Segmentation		
5.4	Swapping		
5.5	Virtual Memory: Concept, Performance Of Demand Paging, Page Replacement Algorithms, Thrashing and Working Sets		
6.	**Input Output Management**	**07 Hours**	**14%**
6.1	I/O Devices, Device Controllers, Direct Memory Access		
6.2	Principles Of Input/output S/W : Goals Of The I/O S/W, Interrupt Handler, Device Driver, Device Independent		
6.3	I/O Software Disks: RAID levels, Disks Arm Scheduling Algorithm, Error Handling.		
7.	**File Systems**	**06 Hours**	**15%**
7.1	File Naming, File Structure, File Types, File Access, File Attributes, File Operations, Memory Mapped Files		
7.2	Directories: Hierarchical Directory System, Pathnames, Directory Operations,		
7.3	File System Implementation, Contiguous Allocation, Linked List Allocation, Linked List Using Index, Inodes		
8.	**Unix/Linux File System**	**04 Hours**	**10%**
8.1	Buffer Cache, Inodes, The system calls - ialloc, ifree, namei, alloc and free		
8.2	Mounting and Unmounting , files systems, Network File systems		
8.3	EXT file system in linux		

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 Outcomes:

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. Modern Operating Systems -By Andrew S. Tanenbaum, Third Edition PHI
2. Operating System Concepts Avi Silberschatz, Peter Baer Galvin, Greg Gagne, Ninth Edition, Wiley

❖ **Reference Books:**

1. Operating Systems, D.M. Dhamdhare, TMH
2. Operating Systems Internals and Design Principles , William Stallings , Seventh Edition, Prentice Hall
3. Unix System Concepts & Applications, Sumitabha Das, TMH
4. Unix Shell Programming, Yashwant Kanitkar, BPB Publications

FACULTY OF TECHNOLOGY & ENGINEERING
U & P U. PATEL DEPARTMENT OF COMPUTER ENGINEERING

CE256: COMPUTER ORGANIZATION

Credits and Hours:

Teaching Scheme	Theory	Practical	Tutorial	Total	Credit
Hours/week	3	0	0	3	3
Marks	100	00	0	100	

A. Objective of the Course:

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

- To explore the basic concepts of computer organization & computer architecture design.
- To explore 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.

B. Outline of the course:

Sr. No.	Title of the unit	Minimum number of hours
1	Introduction to digital logic Circuit	03
2	Register Transfer and Microoperations	08
3	Basic Computer Organization and Design	08
4	Central Processing Unit	08
5	Pipeline and Vector Processing	04
6	Computer Arithmetic	08
7	Memory Organization	06

Total hours (Theory): 45

Total hours: **45**

C. Detailed Syllabus:

1.	**Introduction to digital logic Circuit**	**03 Hours**	**07%**
1.1	Digital Computers		
1.2	Logic Gates		
1.3	Combinational Circuits (Half Adder, Full Adder)		
1.4	Flip-Flops(SR, D, JK, T, Edge-Triggered)		
2.	**Register Transfer and Microoperations**	**08 Hours**	**18%**
2.1	Register Transfer Language		
2.2	Register Transfer		
2.3	Bus and Memory Transfers		
2.4	Arithmetic Microoperation		
2.5	Logic Microoperations		
2.6	Shift Microoperation		
2.7	Arithmetic Logic Shift Unit		
3.	**Basic Computer Organization and Design**	**08 Hours**	**18%**
3.1	Instruction Codes		
3.2	Computer Registers		
3.3	Computer Instructions		
3.4	Timing and Control		
3.5	Instruction Cycle		
3.6	Memory Reference Instructions		
3.7	Input-Output and Interrupt		
3.8	Complete Computer Description		
3.9	Design of Basic Computer		
3.10	Design of Accumulator Logic		
4.	**Central Processing Unit**	**08 Hours**	**17%**
4.1	Introduction		
4.2	General Register Organization		
4.3	Stack Organization		
4.4	Instruction Formats		

4.5	Addressing Modes		
4.6	Data Transfer and Manipulation		
4.7	Program Control		
4.8	RISC		
5.	**Pipeline and Vector Processing**	**04 Hours**	**09%**
5.1	Parallel Processing		
5.2	Pipelining		
5.3	Arithmetic Pipeline		
5.4	Instruction Pipeline		
5.5	RISC Pipeline		
5.6	Vector Processing		
5.7	Array Processors		
6.	**Computer Arithmetic**	**08 Hours**	**18%**
6.1	Introduction: Binary, Octal, Decimal, Hexadecimal representation		
6.2	Integer Numbers: Sign-Magnitude,1's complement,2's complement		
6.3	Addition and Subtraction		
6.4	Multiplication Algorithm		
6.5	Division Algorithm		
6.6	Floating Point Representation and Arithmetic Operations		
7.	**Memory Organization**	**06 Hours**	**13%**
7.1	Memory Hierarchy		
7.2	Main Memory		
7.3	Auxiliary Memory		
7.4	Associative Memory		
7.5	Cache Memory		
7.6	Virtual Memory		

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.
- 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/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. It carries a weightage of 15 Marks as a part of internal theory evaluation.

E. Student Learning Outcomes:

On the successful completion of the course:

- The student would be able to apply the concepts of physics in various branches of engineering.
- An ability to identify, formulate and solve engineering problems.
- An ability to use the techniques, skills and modern tools of physics necessary for engineering applications.
- An ability to design and conduct experiments, analyse and interpret data.

F. Recommended Study Material:

❖ **Text Books:**

1. Computer System Architecture, Morris Mano (3rd Edition) Prentice Hall.

❖ **Reference Books:**

1. William Stalling, Computer Organization & Architecture-Designing for Performance, Pearson Prentice Hall (8th Edition).
2. A.S. Tananbum , Structured Computer Organization, Pearson
3. The Essentials of Computer Organization And Architecture Linda Null, Julia Lobur
4. John P Hayes, Computer Architecture & Organization, McGraw-Hill
5. Computer Architecture: Pipelined and Parallel Processor Design Michael J. Flynn (4th edition)

❖ **Web Materials:**

1. www.nptel.iitm.ac.in

❖ **Simulators:**

1. 8085 Simulator
2. WinDLX Simulator
3. SimpleScalar LLC Simulator