Dr. Babasaheb Ambedkar Technological University, Lonere

(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
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Course Structure and Detailed Syllabus
for

Second Year B. Tech. Programme in Information Technology
(Effective from Academic Year 2021-22)

Rules and Regulations

1. The normal duration of the course leading to B. Tech degree will be EIGHT semesters.
2. The normal duration of the course leading to M. Tech. degree will be FOUR semesters.
3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end-semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra-curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

REGISTRATION:

1. Lower and Upper Limits for Course Credits registered in a semester, by a Full-Time Student of a UG/PG Programme.
   A full-time student of a particular UG/PG programme shall register for the appropriate number of course, credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific regulations pertaining to that UG/PG programme.
2. Mandatory Pre-Registration for higher semesters:
   In order to facilitate proper planning of the academic activities of a semester, it is essential for every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses in exceptionally rare circumstances only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.
3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.
4. A student will be permitted to register in the next semester only if he fulfills the following conditions:

(a) Satisfied all the Academic Requirements to continue with the programme of Studies without termination;
(b) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;
(c) Paid all required advance payments of the Institute and hostel for the current semester;
(d) Not been debarred from registering on any specific ground by the Institute.

EVALUATION SYSTEM:

1. Absolute grading system based on absolute marks as indicated below will be implemented from academic year 2020-21, starting from first year B.Tech.

Percentage of marks	Letter grade	Grade point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awarded based on CGPA of all eight semesters of B. Tech Program.

CGPA for pass is minimum 5.0	
CGPA up to < 5.50	Pass class
CGPA ≥ 5.50 & < 6.00	Second Class
CGPA ≥ 6.00 & < 7.50	First Class
CGPA ≥ 7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

1	Mid Semester Exam (MSE) Marks	20
2	Continuous Assessment Marks	20
3	End Semester Examination (ESE)Marks	60

4. A total of 100 Marks for each practical course are distributed as follows:

1	Continuous Assessment Marks	60
2	End Semester Examination (ESE)Marks	40

It is mandatory for every student of B. Tech to score a minimum of 40 marks out of 100, with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.

This will be implemented from the first year of B. Tech starting from Academic Year 2020-21

5. Description of Grades:

EX Grade: An 'EX' grade stands for outstanding achievement.
EE Grade: The 'EE' grade stands for minimum passing grade.
The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only.
If any of the students remains absent for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.
FF Grade: The 'FF' grade denotes very poor performance i.e., failure in a course due to poor performance. Students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance:

1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(A) Semester Grade Point Average (SGPA): The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10 (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{n} c_i g_i]}{[\sum_{i=1}^{n} c_i]}$$

Where
'n' is the number of subjects for the semester,
'c_i' is the number of credits allotted to a particular subject
'g_i' is the grade-points awarded to the student for the subject based on his performance as per the above table and
-SGPA will be rounded off to the second place of decimal and recorded as such.

(B) Cumulative Grade Point Average (CGPA): An up-to-date assessment of the overall performance of a student from the time he entered the institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (up to two decimal places) starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where
'm' is the total number of subjects from first semester onwards up to and including the semester S,
'c_i' is the number of credits allotted to a particular subject, and
'g_i' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.
-CGPA will be rounded off to the second place of decimal and recorded as such.

Award of Degree of Honours

Major Degree

The concept of Major and Minors at B. Tech level is introduced to enhance learning skills of students, acquisition of additional knowledge in domains other than the discipline being pursued by the student, to make the students better employable with additional knowledge and encourage students to pursue cross-discipline research.

A. Eligibility Criteria for Majors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester.
2. Student willing to opt for majors has to register at the beginning of 5th Semester.
3. The Student has to complete 5 additional advanced courses from the same discipline specified in the curriculum. These five courses should be of 4 credits each amounting to 20 credits. The students should complete these credits before the end of last semester.
4. Student may opt for the courses from NPTEL/ SWAYAM platform (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done).

Student complying with these criteria will be awarded B. Tech (Honours) Degree.

B. Eligibility Criteria for Minors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester.
2. Student willing to opt for minors has to register at the beginning of 5th Semester.
3. The Student has to complete 5 additional courses from other discipline of their interest, which are specified in the respective discipline. These five courses should be of 4 credits each amounting to 20 credits.
4. Student may opt for the courses from NPTEL/ SWAYAM platform (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done).

Student complying with these criteria will be awarded with B. Tech Degree in -------Engineering with Minor in --------Engineering.
(For e.g.: B. Tech in Civil Engineering with Minor in Computer Engineering)

For applying for Honours and Minor Degree the student has to register themselves through the proper system.

ATTENDANCE REQUIREMENTS:

1. All students must attend every lecture, tutorial and practical classes.
2. To account for approved leave of absence (e.g. Representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted.
3. If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination.
4. The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be.
5. In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.
6. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.

7. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

TRANSFER OF CREDITS:

The courses credited elsewhere, in Indian or foreign University/Institutions/Colleges/Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a) 20 % of the total credit will be considered for respective calculations.
b) Credits transferred will be considered for overall credits requirements of the programme.
c) Credit's transfer can be considered only for the course at same level i.e., UG, PG etc.
d) A student must provide all details (original or attested authentic copies) such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.
e) A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.
f) Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.
g) In exceptional cases, the students may opt for higher credits than the prescribed.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

B. Tech. Programme in Information Technology

Second Year B. Tech. (With effect from 2021-22)

Semester III										
Course Category	**Course Code**	**Course Title**	**Teaching Scheme**			**Evaluation Scheme**				
			L	T	P	CA	MSE	ESE	Total	Credit
BSC	BTBS301	Engineering Mathematics - III	3	1	-	20	20	60	100	4
HSSMC	BTHM3402	Interpersonal Communication Skills and Self-Development for Engineers	2	-	-	20	20	60	100	2
PCC	BTITC303*	Computer Architecture and Organization	3	1	-	20	20	60	100	4
PCC	BTITC304	Object Oriented Paradigm with C++	3	1	-	20	20	60	100	4
PCC	BTITC305	Data Structures and Applications	3	1	-	20	20	60	100	4
LC	BTITL306	Object Oriented Paradigm with C ++ Lab	-	-	2	60	-	40	100	1
	BTITL307	Data Structures and Applications Lab	-	-	2	60	-	40	100	1
Seminar	BTITS308	Seminar – I	-	-	-	60	-	40	100	2
Internship	Internship - I	Internship - I Evaluation	-	-	-	-	-	-	-	Audit
			14	**4**	**4**	**280**	**100**	**420**	**800**	**22**
	Semester IV									
HSSMC	BTITHM401	Organizational Behavior	3	-	-	20	20	60	100	3
PCC	BTITC402	Probability and Statistics	3	1	-	20	20	60	100	4
PCC	BTITC403*	Discrete Mathematics	3	1	-	20	20	60	100	4
PCC	BTITC404	Design and Analysis of Algorithms	3	1	-	20	20	60	100	4
PEC	BTITPE405A BTITPE405B BTITPE405C	**Elective-I** Digital Logic and Microprocessor Web Technology Physics of Engineering Materials	2	1	-	20	20	60	100	3
HSSMC	BTITHM406	Constitution of India	2	-	-	-	-	50	50	Audit
LC	BTITL407	Design and Analysis of Algorithms Lab	-	-	2	60	-	40	100	1
	BTITL408	Elective- I Lab	-	-	2	60	-	40	100	1
Seminar	BTITS409	Seminar - II	-	-	-	60	-	40	100	2
Internship	Internship - II	Field Training / Internship/Industrial Training (minimum of 4 weeks which can be completed partially in third semester and fourth semester or at one time).	-	-	-	-	-	-	-	To be audited in V Sem.
			16	**4**	**4**	**280**	**100**	**470**	**850**	**22**

* *These courses are to be studied on self –study mode using SWAYAM/NPTEL/Any other source.*
BSC = Basic Science Course, ESC = Engineering Science Course, PCC = Professional Core Course
PEC = Professional Elective Course, OEC = Open Elective Course, LC = Laboratory Course
HSSMC = Humanities and Social Science including Management Courses

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Engineering Mathematics – III**	**Semester:**	**III**
Course Code:	**BTBS301**	**Course Type:**	**Compulsory**
Prerequisite:	**Engineering Mathematics – II**	**L – T – P:**	**3 – 1 – 0**
Stream:	**Basic Science**	**Credits:**	**4**

Course Objectives:

1. To provide in depth knowledge of complex numbers.
2. To find the solution of differential equations.
3. To find an in-depth knowledge of Fourier series analysis of periodic function.

Course Outcomes:

After learning the course, the students should be able:

1. To develop an ability to use characteristics of complex numbers in problem pertaining to electric circuits.
2. To develop an acquaintance with the method of finding solution of differential equations.
3. To develop an in-depth knowledge of vector differentiation and vector integration.
4. To develop Fourier series expansion of different periodic functions.

Course Content:

UNIT I

Laplace Transform: Definition – conditions for existence, Transforms of elementary functions, Properties of Laplace transforms - Linearity property, First shifting property, Second shifting property, Transforms of functions multiplied by t^n, Scale change property, Transforms of functions divided by t, Transforms of integral of functions, Transforms of derivatives, Evaluation of integrals by using Laplace transform, Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT II

Inverse Laplace Transform: Introductory remarks, Inverse transforms of some elementary functions, General methods of finding inverse transforms, Partial fraction method and Convolution Theorem for finding inverse Laplace transforms, Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT III

Fourier Transform: Definitions – integral transforms, Fourier integral theorem (without proof), Fourier sine and cosine integrals, Complex form of Fourier integrals, Fourier sine and cosine transforms, Properties of Fourier transforms, Parseval's identity for Fourier Transforms.

UNIT IV

Partial Differential Equations and their Applications: Formation of Partial differential equations by eliminating arbitrary constants and functions, Equations solvable by direct integration, Linear equations of first order (Lagrange's linear equations), Method of separation of variables – applications to find

solutions of one-dimensional heat flow equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$, and one-dimensional wave equation (i.e. $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$).

UNIT V

Functions of Complex Variables: Analytic functions, Cauchy- Riemann equations in Cartesian and polar forms, Harmonic functions in Cartesian form, Cauchy's integral theorem, Cauchy's integral formula, Residues, Cauchy's residue theorem (All theorems without proofs).

Text Books:

1. B. S. Grewal, **"*Higher Engineering Mathematics*"**, Khanna Publishers, New Delhi.
2. H. K. Das, Er. Rajnish Verma, **"*Higher Engineering Mathematics*"**, S. Chand & CO. Pvt. Ltd., New Delhi.
3. Dr. B. B. Singh, **"*A course in Engineering Mathematics (Volume-III)*"**, Synergy Knowledge ware, Mumbai.
4. B. V. Ramana, **"*Higher Engineering Mathematics"***, Tata McGraw-Hill Publications, New Delhi.

Reference Books:

1. Erwin Kreyszig, **"*Advanced Engineering Mathematics*"**, John Wiley & Sons, New York.
2. Peter O' Neil, ***"A Text Book of Engineering Mathematics"***, Thomson Asia Pvt. Ltd., Singapore.
3. C. R. Wylie, L. C. Barrett, ***"Advanced Engineering Mathematics"***, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. C. R. Wylie & L. C. Barrett, ***"Integral Transforms and their Engineering Applications"***, Synergy Knowledge ware, Mumbai.
5. I. N. Sneddon, ***"Integral Transforms"***, Tata McGraw-Hill, New York.

General Instructions:

1. The tutorial classes in Engineering Mathematics-III are to be conducted batch wise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Interpersonal Communication Skills and Self-Development for Engineers**	**Semester:**	**III**
Course Code:	**BTHM3402**	**Course Type:**	**Compulsory**
Prerequisite:	**Nil**	**L – T – P:**	**2 - 0 - 0**
Stream:	**Humanities, Social Science and Management**	**Credits:**	**2**

Course Objectives:

1. To build the skills like team building so that they can work efficiently in groups.
2. To provide knowledge of conflict management while working in large organizations.
3. To develop management skills required in routine work environment.
4. To polish the personality of the learners in order to make them good leaders and employees.
5. To imbibe qualities like manners & etiquettes coordination, mutual understanding for their colleague while working in group.

Course Outcomes:

After learning the course, the students should be able:

1. To acquire interpersonal communication skills.
2. To develop the ability to work independently.
3. To develop the qualities like self-discipline, self-criticism and self-management.
4. To have the qualities of time management and discipline.
5. To present themselves as an inspiration for others.

Course Content:

UNIT I

Development of Proficiency in English: Speaking skills, Feedback & questioning technique, Objectivity in argument (Both one on one and in groups), 5 Ws & 1 H & 7 Cs for effective Communication, Imbibing Etiquettes and manners, Study of different pictorial expressions of non-verbal communication and their analysis.

UNIT II

Self-Management: Self-Management, Self-Evaluation, Self-discipline, Self-criticism, Recognition of one's own limits and deficiencies, dependency etc., Self-Awareness, Self-Management, Identifying one's strengths and weaknesses, Planning & Goal setting, Managing self-emotions, Ego, Pride, Leadership & Team Dynamics.

UNIT III

Time Management Techniques: Practice by game playing and other learning strategies to achieve the set targets, Time Management Concept, Attendance, Discipline & Punctuality.

UNIT IV

Motivation/ Inspiration: Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation, Motivation techniques: Motivation techniques based on needs and field situations.

UNIT V

Interpersonal Skills Development: Positive Relationship, Positive Attitudes, and Empathies: comprehending others' opinions, points of views, and face them with understanding, Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills,
Effective Computing Skills: Designing an effective Presentation: Contents, appearance, themes in a presentation, Tone and Language in a presentation, Role and Importance of different tools for effective presentation.

Text Book:

1. Minakshi Raman, Sangeeta Sharma, ***Technical Communication: Principles and Practice***, Oxford University Press, 3rd edition, 2017.

Reference Books:

1. Mitra, Barun, ***"Personality Development and Soft Skills"***, Oxford University Press, 2016.
2. Ramesh, Gopalswamy, ***"The Ace of Soft Skills: Attitude, Communication and Etiquette for Success"***, Pearson Education, 2013.
3. Covey, Stephen R., ***"Seven Habits of Highly Effective People: Powerful Lessons in Personal Change"***.
4. Rosenberg Marshall B., ***"Nonviolent Communication: A Language of Life"***, Puddle Dancer Press, 3rd edition.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Computer Architecture and Organization**	**Semester:**	**III**
Course Code:	**BTITC303**	**Course Type:**	**Compulsory**
Prerequisite:	**Nil**	**L – T – P:**	**3 – 1 – 0**
Stream:	**Core**	**Credits:**	**4**

Course Objectives:

1. To understand the structure, functions and characteristics of computer systems.
2. To learn basics of Computer Architecture.
3. To study hierarchical memory system including cache memories and virtual memory.
4. To identify input / output devices and their data transfer mechanisms.

Course Outcomes:

After learning the course, the students should be able:

1. To identify components of a computer system including CPU, memory and input/output units.
2. To explain instruction types, its execution and interrupt mechanism.
3. To illustrate numerical and character representations in digital logic and floating-point arithmetic.

Course Content:

UNIT I

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

UNIT II

Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

UNIT III

Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems, External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

UNIT IV

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

UNIT V

Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct

memory access, I/O channels and processors, External interface. Instruction pipe-lining: Concepts, Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.

Text Books:

1. William Stalling, ***"Computer Organization and Architecture: Designing for Performance"***, Prentice Hall Publication, 8th edition, 2009.
2. Hayes, ***"Computer Architecture and Organization"***, McGraw-Hill Publication, 3rd edition, 2012.
3. Zaky, **"*Computer Organization"***, McGraw-Hill Publication, 5th edition, 2011.

Reference Books:

1. Morgan, Hennessy, Patterson, ***"Computer Architecture: A Quantitative Approach"***, Kaufman Publication, 4th edition, 2007.
2. Morris Mano, ***"Computer System Architecture"***, Pearson Education India, 3rd edition, 2007.
3. Mostafa Abd-El-Barr, Hesham El-Rewini, ***"Fundamentals of Computer Organization and Architecture"***, Wiley Publication, 1st edition, 2004.
4. Miles J. Murdocca, Vincent P. Heuring, ***"Computer Architecture and Organization: An Integrated Approach"***, Wiley Publication, 1st edition, 2007.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Object Oriented Paradigm with C++**	**Semester:**	**III**
Course Code:	**BTITC304**	**Course Type:**	**Compulsory**
Prerequisite:	**Computer Programming in C**	**L – T – P:**	**3 – 1 – 0**
Stream:	**Core**	**Credits:**	**4**

Course Objectives:

1. To understand object oriented programming paradigm.
2. To develop programming skills in C++.

Course Outcomes:

After learning the course, the students should be able:

1. To draw the control flow of a program.
2. To understand the storage concepts in a simple program.
3. To program using basic concepts of OO languages i.e., objects, encapsulation, data hiding, polymorphism etc.
4. To program using advanced concepts of OO languages such as exception handling etc.
5. To work with files and its different mode.

Course Content:

UNIT I

Object Oriented Programming Paradigm: Basic concepts, Benefits, Object oriented languages, Applications, Object Oriented Systems Development: Object oriented analysis, Object oriented design.

UNIT II

Beginning with C++: Tokens, Data types, Operators, Expressions and Control structures, Array, Functions, Structures and Unions, Class and Objects, specifying a class, Defining member functions, Private member functions, Static data and member functions, Arrays of objects, Friend functions.

UNIT III

Constructors and Destructors: Constructor, Parameterized constructors, Multiple constructors in a class, Copy constructors, Dynamic constructors, Destructors, Inheritance: Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes.

UNIT IV

Polymorphism: Operator overloading, Function overloading, Virtual functions, Pure virtual functions, Abstract class, Working with Files: Classes for file stream operations and I/O stream operations, Opening and closing a file, Detecting end-of-file, More about Open (): File Modes, Sequential input and output operations.

UNIT V

Exception Handling: Basics, Mechanism, Types of exceptions, Catching exceptions, Multiple catching, Nested try statements, Throwing, Rethrowing, Specifying exceptions.

Text Books:

1. E. Balagurusamy, ***"Object Oriented Programming with C++"***, McGraw Hill publication, 7th edition, 2017.
2. Robert Lafore, ***"Object Oriented Programming in C++"***, Pearson India, 4th edition, 2008.

Reference Books:

1. J. R. Hubbard, ***"Programming with C++: Schaum's Outlines"***, McGraw-Hill education, 3rd edition, 2009.
2. P. J. Deitel, H.M. Deitel, ***"C++ How to Program"***, Pearson Education, 10th edition, 2016.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Data Structures and Applications**	**Semester:**	**III**
Course Code:	**BTITC305**	**Course Type:**	**Compulsory**
Prerequisite:	**Computer Programming in C**	**L – T – P:**	**3 – 1 – 0**
Stream:	**Core**	**Credits:**	**4**

Course Objectives:

1. To choose the appropriate data structure and algorithm design method for a specified application.
2. To assess how the choice of data structures and algorithm design methods affects the performance of programs.
3. To solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps, binary search trees, graphs and writing programs for these solutions.

Course Outcomes:

After learning the course, the students should be able:

1. To write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem.
2. To think of all possible inputs to an application and handle all possible errors properly.
3. To analyze clearly different possible solutions to a program and select the most efficient one.
4. To write an application to demonstrate a good working solution.
5. To demonstrate the ability to write reusable code and abstract data types with object based approach.

Course Content:

UNIT I

Introduction to Data Structures and Analysis of Algorithms: Need of data structures, Types of data structures, Recursion, ADT (Abstract Data Types), Basics of algorithm, Analysis of algorithm through time complexity and space complexity, Asymptotic notations.

UNIT II

Stack and Queue: Stack representation, Stack operation, Application, Queue representation, Queue operation, Circular and priority queue, Linked list: Operation on linked list, Linked stacks and Queues, Array implementation of linked list, doubly linked list, Circular linked list.

UNIT III

Binary Tree: Basic tree concept, Binary tree operations, Binary tree representation, Binary tree traversals, Binary search tree and operations, Applications of binary trees.

UNIT IV

Graphs: Basics concepts of graphs, Representation of graphs, Graph traversals BFS and DFS, Minimum spanning tree algorithms: Kruskal's algorithm and Prim's algorithm, Application of graph.

UNIT V

Searching and Sorting Techniques: Linear search and binary search, Sorting techniques: Various sorting methods and their time complexity: Insertion sort, Selection sort, Merge sort, Quick sort, Heap sort.

Text Books:

1. E. Horowitz, D. Mehta, S. Sahni, ***"Fundamentals of Data Structures in C++"***, Silicon Press, 2nd edition, 2008.
2. Semour Lipschutz, ***"Data Structures with C"***, Tata McGraw-Hill, 1st edition, 2010.
3. R.S. Bichkar, ***"Programming with C and Data structures"***, Universities Press, 1st edition, 2014.

Reference Books:

1. Goodrich, Tamassia, "***Data Structures and Algorithm in Java***", Wiley publication, 6th edition, 2014.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, "***Introduction to Algorithms***", MIT Press, 3rd edition, 2009.
3. V. Goyal, L. Goyal, P. Kumar, "***A Simplified Approach to Data Structures***", Shroff Publishers, 1st edition, 2014.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Object Oriented Paradigm with C++ Lab**	**Semester:**	**III**
Course Code:	**BTITL306**	**Course Type:**	**Compulsory**
Prerequisite:	**Computer Programming in C**	**L – T – P:**	**0 – 0 – 2**
Stream:	**Core**	**Credits:**	**1**

Lab Experiments List:

1. Raising a number n to a power p is the same as multiplying n by itself p times. Write a function called power () that takes a double value for n and an int value for p, and returns the result as double value. Use a default argument of 2 for p, so that if this argument is omitted, the number will be squared. Write a main () function that gets values from the user to test this function.
2. A point on the two-dimensional plane can be represented by two numbers: An X coordinate and a Y coordinates. For example, (4, 5) represents point 4 units to the right of the origin along the X axis and 5 units up the Y axis. The sum of two points can be defined as a new point whose X coordinate is the sum of the X coordinates of the points and whose Y coordinate is the sum of their Y coordinates. Write a program that uses a structure called point to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with the program might look like this:
   Enter coordinates for P1: 3 4
   Enter coordinates for P2: 5 7
   Coordinates of P1 + P2 are: 8, 11
   Create the equivalent of a four-function calculator. The program should request the user to enter a number, an operator and another number. It should then carry out the specified arithmetical operation: adding, subtracting, multiplying or dividing the two numbers (It should use a switch statement to select the operation). Finally, it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be Y or N. Some sample interaction with the program might look like this:
   Enter first number, operator, second number: 10/ 3
   Answer = 3.333333
   Do another (Y/ N)? Y
   Enter first number, operator, second number 12 + 100
   Answer = 112
   Do another (Y/ N)? N
3. A phone number, such as (212) 767-8900 can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure phone. Create two structure variables of type phone. Initialize one and have the user input a number for the other one. Then display both numbers. The interaction might look like this:
   Enter your area code, exchange and number: 415 555 1212
   My number is (212) 767-8900
   Your number is (415) 555-1212

4. Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results maybe a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.
5. Create a class rational which represents a numerical value by two double values- NUMERATOR and DENOMINATOR. Include the following public member functions:
   constructor with no arguments (default), constructor with two arguments, void reduce () that reduces the rational number by eliminating the highest common factor between the numerator and denominator.
   Overload + operator to add two rational numbers
   Overload - operator to enable input through cin
   Overload * operator to enable output through cout
   Write a main ( ) to test all the functions in the class.
6. Consider the following class definition:

```
class father {
protected age;
public;
father (int x) {age = x;}
virtual void iam()
{
cout<<“I AM THE FATHER ” ;
cout<< “My age is:” <<age<<endl;
}
};
```

   Derive the two classes son and daughter from the above class and for each, define iam () to write similar but appropriate messages. You should also define suitable constructors for these classes. Now, write a main () that creates objects of the three classes and then calls iam ( ) for them. Declare pointer to father. Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam () through the pointer to demonstrate polymorphism in action.
7. Write a program that creates a binary file by reading the data for the students from the terminal. The data of each student consist of roll number, name (a string of 30 or less number of characters) and marks.
8. A hospital wants to create a database regarding its indoor patients. The information to store includes:
   Name of the patient
   Date of admission
   Disease
   Date of discharge

Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the patients to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

9. Imagine a tollbooth with a class called tollbooth. The two data items are a type unsigned int to hold the total number of cars and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar () increments the car total and adds 0.50 to the cash total. Another function called nopayCar (), increments the car total but adds nothing to the cash total. Finally, a member function called display () displays the two totals i.e., total cars and total cash. Write a program to test this class. This program should allow the user to push one key to count a paying car and another to count a nonpaying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Data Structures and Applications Lab**	**Semester:**	**III**
Course Code:	**BTITL307**	**Course Type:**	**Compulsory**
Prerequisite:	**Computer Programming in C**	**L – T – P:**	**0 – 0 – 2**
Stream:	**Core**	**Credits:**	**1**

Lab Experiments List:

1. Implementation of Stacks, Queues (using both arrays and linked lists).
2. Implementation of circular queue using arrays.
3. Implementation of recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers: i) Linear search ii) Binary search.
4. Implement a program to evaluate a given postfix expression using stacks.
5. Implement a program to convert a given infix expression to postfix form using stacks.
6. Implement the following operations on singly linked list:
   i) Creation ii) Insertion iii) Deletion iv) Traversal.
7. Implementation of Polynomial arithmetic using linked list.
8. Implement the following operations on circular linked list:
   i) Creation ii) Insertion iii) Deletion iv) Traversal.
9. Implementation of recursive and iterative traversals on binary tree.
10. Implementation of the following operations on binary search tree (BST):
    (a) Minimum key (b) Maximum key (c) Search for a given key (d) Delete a node with given key.
11. Implementation of graph traversals by applying: (a) BFS (b) DFS.
12. Implement the following sorting algorithms:
    (a) Bubble sort (b) Insertion sort (c) Quick sort (d) Heap sort.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Organizational Behavior**	**Semester:**	**IV**
Course Code:	**BTITHM401**	**Course Type:**	**Compulsory**
Pre-requisite:	**Nil**	**L – T – P:**	**3 – 0 – 0**
Stream:	**Humanities, Social Science and Management**	**Credits:**	**3**

Course Objective:

1. To explore the organization as a micro-social system, a medium to facilitate and improve the interpersonal relationships in the context of organizational functioning.

Course Outcomes:

After learning the course, the students should be able:

1. To become more self-aware and have identified areas of development for long term effectiveness.
2. To understand the role that individuals play collectively to perform in organizations.

Course Content:

UNIT I

Introduction to Organizational Behavior: Management and organizational behavior, Complementing intuition with systematic study, Disciplines and opportunities for OB, Developing an OB Model, Diversity in organizations: Diversity, Discrimination, Biographical characteristics, Other differentiating characteristics, Ability, Implementing diverging managements strategies.

UNIT II

Attitudes and job satisfaction: Attitudes, Attitudes and behavior, Measuring job satisfaction, What causes job satisfaction?, Outcomes of job satisfaction, The impact of job dissatisfaction, Emotions and moods, Sources of emotions and moods, Emotional labor, Affective events theory, Emotional intelligence, Emotion regulation, OB application of emotions and moods, Personality and values: personality, Personality frameworks, Other personality attributes relevant to OB, Personality and situation, Values, Linking an individual's personality and values to the workplace, Cultural values.

UNIT III

Perception and individual decision, What is person perception?, Perception: Making judgments about others, the link between perception and individual decision making, Decision making in organizations, Influences on decision making: individual differences and organizational constraints, Ethics in decision making, Creativity: creative decision making and innovation in organizations, Motivation concepts, Early theories of motivation, Contemporary theories of motivation, Job engagement, Integrating contemporary theories of motivation, Motivation: from concepts to application, Motivating by job design: the Job Characteristic Model (JCM) using job redesign to motivate employees using alternative work arrangements to motivate employees, using Employees Involvements and Participation (EIP) to motivate employees, using extrinsic and intrinsic rewards to motivate employees, using benefits to motivate employees, Motivating employees through company culture.

UNIT IV

Foundation of group behavior: Group and group identity, Stages of group development, Group, differences between group and teams, Types of teams, Creating effective teams, Turning individuals into team players, Communication, Direction of communication, Modes of communication, Choice of communication, Persuasive communication, Cultural factors, Rewards, Competency-based rewards, Performance-based rewards, Empowerment and self-managed teams.

UNIT V

Leadership, Trait theories of leadership, Behavioral theories, Contingency theories, Contemporary theories of leadership, Responsible leadership, Positive leadership, Challenges of leadership, Power and leadership: bases of power, Power tactics, How power affects people?, Politics: power in action, Causes and consequences of political behavior, Conflict: definition, the conflict process, Negotiation, the negotiation process, Third party negotiation, Foundations of organization structure, Common organizational frameworks structures, Alternate design options, Organizational designs and employees behavior, Organizational culture, Creating and sustaining culture, Organizational change and stress management, Resistance to change, Approaches to managing organizational change.

Text Books:

1. Stephen P. Robbins, Timothy A. Judge, Neharika Vohra, ***"Organizational Behaviour"***, Pearson Publication, 15th edition, 2014.
2. Uma Sekaran, **"*Organizational Behavior"***, McGraw Hill Company, New Delhi, 2011.
3. L. M. Prasad, ***"Organizational Behavior"***, S. Chand and Co. Ltd, New Delhi, 2008.
4. Nair, Banerjee, Agarwal, **"*Organization Behavior"***, Pragati Prakashan, New Delhi, 2006.

Reference Books:

1. Rosy Joshi, Shashi K Gupta, **"*Organisational Behaviour"***, Kalyani publishers, New Delhi, 2005.
2. S. S. Khanka, **"*Organizational Behavior"***, S. Chand and Co. Ltd, New Delhi, 2008.
3. Fred Luthans, **"*Organizational Behavior"*,** McGraw Hill International Edition, 11th edition.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Probability and Statistics**	**Semester:**	**IV**
Course Code:	**BTITC402**	**Course Type:**	**Compulsory**
Pre-requisite:	**Engineering Mathematics III**	**L – T – P:**	**3 – 1 – 0**
Stream:	**Core**	**Credits:**	**4**

Course Objectives:

1. To understand probability concepts.
2. To acquire knowledge of probability distributions.
3. To get exposer to hypothesis testing using distributions.
4. To understand principles of queuing theory.
5. To be exposed to discrete time Markov chain.

Course Outcome:

After learning the course, the students should be able:

1. To acquire analytical ability in solving mathematical problems as applied to the respective branches of engineering.

Course Content:

UNIT I

Probability Theory: Definition of probability: Classical, Empirical and Axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities with proofs, Examples, Random Variable and Mathematical Expectation: Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.

UNIT II

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.

UNIT III

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors, Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

UNIT IV

Testing of Hypothesis: Introduction to Sampling Distributions, Population and Sample, Null Hypothesis and Alternative Hypothesis, Single and Two Tailed Test, Testing of Hypothesis, Level of Significance, Critical Region, Procedure for Testing of Hypothesis Large Sample Test- Test for Single Proportion,

Two Sample Proportions, Large Sample Test- Test for Single Mean, Two Sample Means, Small Sample Tests – "t" Test For a Single Mean, "t" Test for the difference of Means, Paired "t" Test, F Test – Test of Significance of the Difference between Two Population Variances, Chi Square Test for Goodness of Fit, Independence of Attributes.

UNIT V

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, Second degree parabolas and more general curves, Markov Chains: Introduction to Stochastic process, Markov process, Markov chain one step & n-step Transition Probability, Classification of states of a Markov chain – Applications.

Text Books:

1. Veerarajan T., ***"Probability, Statistics and Random Processes"***, Tata McGraw Hill, 1st reprint, 2004.
2. S. C. Gupta and V.K. Kapoor, ***"Fundamentals of Mathematical Statistics"***, Sultan Chand & Sons, 9th extensively revised edition, 1999.
3. G. V. Kumbhojkar, "***Probability and Random Processes"***, C. Jamnadas and Co., 14th edition, 2010.
4. Erwin Kreyszig, ***"Advanced Engineering Mathematics***", John Wiley & Sons, 9th edition, 2006.
5. Veerarajan T., ***"Engineering Mathematics (for semester III)***", Tata McGraw-Hill, New Delhi, 2010.
6. G. Haribaskaran, "***Probability, Queuing Theory and Reliability Engineering***", Laxmi Publications, 2nd edition, 2009.
7. Murray Spiegel, John Schiller, R. ALU Srinivasan, ***"Probability and Statistics***", Schaum's Outlines, 4th edition, 2013.

Reference Books:

1. Trivedi K. S., ***"Probability and Statistics with reliability, Queueing and Computer Science Applications***", Prentice Hall of India, New Delhi, 1984.
2. Gross.D, Harris.C.M., ***"Fundamentals of Queuing Theory"***, John Wiley and Sons, 1985.
3. Allen. A. O., ***"Probability Statistics and Queuing Theory"***, Academic Press, 1981.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Discrete Mathematics**	**Semester:**	**IV**
Course Code:	**BTITC403**	**Course Type:**	**Compulsory**
Prerequisite:	**Nil**	**L – T – P:**	**3 – 1 – 0**
Stream:	**Core**	**Credits:**	**4**

Course Objectives:

1. To develop a foundation of set theory concepts, notation and applications.
2. To inculcate the habit of logical and mathematical thinking and its application to Information Technology.
3. To understand logic, basic counting principles, relations, induction, sequences and summations.
4. To be able to present a coherent and mathematically accurate argument.
5. To understand the theory of graphs and algebraic structures and their applications.

Course Outcomes:

After learning the course, the students should be able:

1. To perform operations on various discrete structures such as sets functions, relations and sequences.
2. To solve problems using counting techniques, permutation and combination, recursion and generating functions.
3. To use graphs as tools to visualize and simplify problems.
4. To solve problems using algebraic structures (Rings, Monoids and Groups).

Course Content:

UNIT I

The Foundations: Sets theory and its applications, Set operations, Laws of set theory, Power sets, Partitions, Multi-sets, Cardinality, Principle of inclusion and exclusion, Applications of sets: Problems on set operations and principle of inclusion-exclusion, Propositional logic, Propositional equivalences, Propositional algebra, Basic logical operations, De Morgan's laws, Predicates and quantifiers, Nested quantifiers, Rules of inference, Proof methods and strategy, Applications of logic: Translating English statements into propositions, Boolean searches in web pages, Bit operations.

UNIT II

Induction and recursion: Mathematical induction, Strong induction, Recursive definitions, Re-cursive algorithms, Applications: Proofs using mathematical induction, Functions: Definition and types of functions: Injective, Subjective and bijective, Composition, Identity and inverse of function, Re-cursively defined functions, Applications of functions, Job scheduling problem.

UNIT III

Basic Counting Principles: Permutations, Combinations, Binomial coefficients, Generalized permutations and combinations, Combinations and permutations with repetition, Generating permutations and combinations, Recurrence relation, Solving linear recurrence relations with constant coefficients, Applications of counting principles, Pigeonhole principle and its applications.

UNIT IV

Relations: Properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations and partitions, Partial ordering relations and lattice application of relations: N-ary relations and their applications, Databases and relations. Algebraic Structures: Algebraic systems, Groups, Semi groups, Monoid, Subgroups, Permutation groups, Codes and group codes, Isomorphism and automorphisms, Homomorphism, Fermat's little theorem, Polynomial rings, Applications of groups, Ring, Field.

UNIT V

Graph Theory: Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path in weighted graph, Hamiltonian and Euler paths and circuits, Factors of a graph, Shortest path algorithm, Traveling salesman problem, Planar graph and Kuratowsk is graph and theorem, Independent sets, Graph coloring, Trees, Rooted trees, Path length in rooted trees, Binary search trees, Spanning trees and cut set, Theorems on spanning trees, Cut sets, Circuits, Minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree.

Text Books:

1. K. H. Rosen, ***"Discrete Mathematics and Its Applications"***, Tata McGraw Hill Publication, 8th edition, 2018.
2. J. P. Tremblay, R. Manohar, ***"Discrete Mathematical Structures with Applications to Computer Science"***, McGraw Hill Publication, 1st edition, 2001.
3. C. L. Liu, "***Elements of Discrete Mathematics"***, McGraw-Hill Publication, 3rd edition, 2008.

Reference Books:

1. B. Kolman, R. Busby, S. Ross, ***"Discrete Mathematical Structures"***, Pearson Education, 6th edition, 2009.
2. R. K. Bisht, H. S. Dhami, ***"Discrete Mathematics"***, Oxford University Press, 2015.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Design and Analysis of Algorithms**	**Semester:**	**IV**
Course Code:	**BTITC404**	**Course Type:**	**Compulsory**
Pre-requisite:	**Data Structures and Applications**	**L – T – P:**	**3 – 1– 0**
Stream:	**Core**	**Credits:**	**4**

Course Objectives:

1. To learn fundamentals of algorithms design techniques.
2. To understand basic knowledge of computational complexity, selection of the best algorithm to solve a problem.
3. To analyze the performance of algorithms and compare them with respect to time and space complexity.
4. To develop proficiency in problem solving and programming.

Course Outcomes:

After learning the course, the students should be able:

1. To develop efficient algorithms for simple computational tasks.
2. To understand concepts of time and space complexity, worst case, average case and best case complexities.
3. To design algorithms such as sorting, searching and problems involving graphs.
4. To compute complexity measures of recursive algorithms using recurrence relations.

Course Content:

UNIT I

Introduction: Instruction counts, Growth functions, Necessity of time and space analysis of algorithms, Order notations (O, Θ, Ω notations), Problem instance size, Frequently occurring recurrence relations in analysis of algorithms.

UNIT II

Divide and Conquer: Binary search, Finding maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication, Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge pattern, Single source shortest paths.

UNIT III

Dynamic Programming: Multistage graphs, All pairs shortest paths, Knapsack problem, Travelling salesman problem.

UNIT IV

Graph Theory: Elementary Algorithms: DFS, BFS, Topological Sort, Minimum spanning trees (Kruskal and Prim's algorithms).

UNIT V

Introduction to Backtracking and Branch and bound strategy, NP Hard and NP complete problems.

Text Books:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, ***"Introduction to Algorithms"***, MIT Press, 3rd edition, 2010.
2. E. Horowitz, S. Sahni and S. Rajsekaran, ***"Computer Algorithms"***, Silicon Press, 2nd edition, 2008.

Reference Books:

1. B. K. Joshi, ***"Data Structures and Algorithms in C++"***, Tata McGraw Hill Education, 2010.
2. G. T. Heineman, Gary Pollice, Stanley Selkow, ***"Algorithms in a Nutshell"***, Shroff Publication, 2nd edition, 2016.
3. Kyle Loudon, ***"Mastering Algorithms with C"***, O' Reilly Publication, 1st edition, 2009.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Digital Logic and Microprocessor**	**Semester:**	**IV**
Course Code:	**BTITPE405A**	**Course Type:**	**Elective**
Prerequisite:	**Nil**	**L – T – P:**	**2 – 1 – 0**
Stream:	**Professional Core**	**Credits:**	**3**

Course Objectives:

1. To learn Boolean algebra, logic gates, logic families, realization of Boolean expressions and minimization techniques.
2. To study the sequential logic circuits design used in synchronous and asynchronous modes.
3. To understand 8086 microprocessor Architecture.
4. To understand design aspects of I/O and Memory Interfacing circuits.
5. To acquaint with instruction set and logic required to build assembly language programs.

Course Outcomes:

After learning the course, students should be able:

1. To apply the knowledge of number systems and codes in problem solving related to code conversion and number system and optimize circuit design.
2. To explain the fundamental concepts of combinational and sequential logic devices and design them.
3. To explain 8086 architecture and its instruction set.
4. To develop assembly language programs for the X86 microprocessor.
5. To interface peripheral chips and describe the role of interrupt in microprocessor family.

Course Content:

UNIT I

Switching Theory**:** Boolean algebra, Logic gates and switching functions, Truth tables and switching expressions, Minimization of completely and incompletely specified switching functions, Karnaugh map and Quine-McCluskey method, Multiple output minimization, Representation and manipulation of functions using BDDs, Two-level and multi-level logic circuit synthesis.

UNIT II

Combinational Logic Circuits: Realizing logical expressions using different logic gates, Realization of adders and subtractors, Design of multiplexers, Demultiplexers, Design of combinational circuits using combinational IC's, Design of code converters, Comparators and decoders.

UNIT III

Sequential Circuits: Clocks, Flip-flops, Latches, Counters and shift registers, Finite-state machine model, Synthesis of synchronous sequential circuits, Minimization and state assignment, Asynchronous sequential circuit synthesis.

UNIT IV

Introduction of 8086 Microprocessor: Evolution of Microprocessor, Architecture, Pin diagram, Minimum and maximum mode bus configuration, Memory interfacing, Memory Map, Address decoding

logic. Instruction Set, Addressing modes, Assembly language programming, Assembler directives, Stacks and subroutines. Bus cycle, wait state, Timing diagrams, Interrupt structure, ISR. 8087 Math Co-processor: Study of architecture of 8087.

UNIT V

I/O Interfacing: Memory mapped I/O, I/O mapped I/O, Polled I/O, PPI 8255, Various operating modes of 8255, Interfacing, and programming, 4x4 key matrix interfacing, Study of Interrupt Controller 8259A. Introduction to Microcontroller: Architecture of 8051, Instruction Set, Pin Diagram, Introduction to PIC microcontroller.

Text Books:

1. R. P. Jain, ***"Modern Digital Electronics",*** Tata McGraw Hill Publication, 4th edition, 2010.
2. A. Nagoor Kani, ***"Microprocessor and Microcontroller"***, Tata McGraw Hill Publication, 2nd edition, 2012.

Reference Books:

1. D. P. Leach, A. P. Malvino, G. Saha, ***"Digital Principles and Applications"***, McGraw Hill Publication, 8th edition, 2014.
2. Yu- Cheng Liu, Glenn A. Gibson, ***"Microcomputer systems: 8086/88 family architecture, Programming and Design"***, Pearson Publication, 2nd edition, 2015.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Web Technology**	**Semester:**	**IV**
Course Code:	**BTITPE405B**	**Course Type:**	**Elective**
Prerequisite:	**Nil**	**L – T – P:**	**2 – 1– 0**
Stream:	**Professional Core**	**Credits:**	**3**

Course Objectives:

1. To become familiar with modern web technologies.
2. To use different web scripting technology.
3. To understand web hosting, server type, debugging, and performance driven application development.
4. To understand user interface and be aware of real world scenario.

Course Outcomes:

After learning the course, the students should be able:

1. To understand World Wide Web and latest trends in web development.
2. To obtain real world knowledge of design and development.
3. To design and develop web application with all industrial standards.
4. To understand web hosting, server types and debugging.

Course Content:

UNIT I

Introduction to World Wide Web, Features of web, HTTP, Web Servers, Introduction to Scripting Language, Browser, Integrated Development Environment.

UNIT II

HTML: Introduction to HTML, Basics of HTML, Formatting and fonts, Commenting code, HTML heading, Block element, Inline element, Comment, Attributes, Hyperlink, Lists, Tables, Images, Forms, Meta tags, Character entities, Frames sets.

UNIT III

Advance HTML: Overview and features of HTML5, Includes External File, Responsive Layout with Media Queries, Marquee, Semantic Tags, HTML Symbol, URL Encode, Cashing, Video Tags, Audio Tags, Image Maps.CSS: Introduction to CSS, Selector, Basic syntax and structure, Padding, Margin, Manipulating Texts, Display, Height, Width, Border, Color, Fonts, Positioning Using CSS, Overview and features of CSS3.

UNIT IV

PHP**:** Introduction to PHP, Features of PHP, Basics of PHP, Syntax, Variable, Printing Output, Array, String, Function, Data types, Operator, Loops, Conditional Statement, Introduction to Advance PHP, Form Processing, Files, PHP Cookies, PHP Sessions, Constant, PHP Magic Function, PHP Global Variable, Error Handling, Exception, Connection with Database, Curd Operation in PHP.

UNIT V

Web Hosting, Debugging and Unit Testing, Browser Compatibility.

Text Books:

1. Thomas Powell, **"*HTML & CSS: The Complete Reference*"**, McGraw Hill Publication, 5th edition, 2017.
2. Snehal Joglekar, **"*HTML and CSS- Web Technologies*"**, Nirali Prakashan, 2016.

Reference Book:

1. Steven Holzner, **"*PHP: The Complete Reference*"**, McGraw Hill Publication, Study edition, 2017.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Physics of Engineering Materials**	**Semester:**	**IV**
Course Code:	**BTITPE405C**	**Course Type:**	**Elective**
Prerequisite:	**Engineering Physics**	**L – T – P:**	**2 – 1– 0**
Stream:	**Professional Core**	**Credits:**	**3**

Course Objective:

1. To understand and apply the Physics principles behind the development of Engineering Materials.

Course Outcome:

After learning the course, the students should be able:

1. To understand fundamentals of Electrodynamics, Crystal structure, Semiconductors, Dielectrics, Nano materials, Magnetic and superconducting materials.
2. To understand the basics of advanced devices and technology.

Course Content:

UNIT I

Crystallography: Crystal direction and planes, Diatomic Crystal (CsCl, NaCl, Diamond, $BaTiO_3$) Crystal imperfection, Point defects, Line defects, Surface and volume defects, Structure properties relationship, Structure determination by X-ray diffraction.

UNIT II

Magnetic Materials: Origin of magnetization using atomic theory classification of magnetic materials and properties, Langevin's theory and Dia, Para and ferromagnetism, Soft and Hard Magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Anti-ferromagnetic and Ferromagnetic materials, Ferrites and Garnets, Magnetic bubbles, Magnetic recording.

UNIT III

Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductor, Application of superconductors (Cryotron, magnetic levitation).

UNIT IV

Semiconducting Material: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductor, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell.

UNIT V

Dielectric Materials: Dielectric constant and polarizability, Types of polarization, Temperature and frequency dependences of Dielectric parameter, Internal fields in solids, Clausius-Mosotti equation, Dielectric loss, Dielectric breakdown, Ferroelectric, Pyroelectric and piezoelectric materials, applications of dielectric materials,

Nanomaterials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes,

Characterization techniques of nano materials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.

Text Books:

1. C. Kittle, ***"Introduction to Solid state Physics"***, Wiley Publication, 8th edition, 2012.
2. C.M. Srivastava and C. Srinivasan, ***"Science of Engineering Materials and Carbon Nanotubes"***, New Age International Publishers, 3rd edition, 2010.
3. A. J. Dekker, ***"Solid State Physics",*** Laxmi Publication, 2008.

Reference Books:

1. V. Raghavan, "***Material Science and Engineering: A First Course***", PHI Learning Publication, 6th edition, 2015.
2. A.J. Dekker, ***"Electrical Engineering Material",*** PHI Publication, 1970.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Constitution of India**	**Semester:**	**IV**
Course Code:	**BTITHM406**	**Course Type:**	**Compulsory**
Pre-requisite:	**Nil**	**L – T – P:**	**2 – 0 – 0**
Stream:	**Humanities, Social Science and Management**	**Credits:**	**Audit**

Course Objectives:

1. To enable the student to understand the importance of constitution.
2. To study public administration.
3. To understand the structure of executive, legislature and judiciary.
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.

Course Outcomes:

After learning the course, the students should be able:

1. To know salient features of the Indian Constitution.
2. To understand directive principles of state policy, its nature and importance.
3. To understand structure, function and powers of Election Commission of India.
4. To be aware of structure of Indian Judiciary, types of court, characteristics of Indian Judiciary.

Course Content:

UNIT I

Introduction to Indian Constitution:
Historical background, Philosophy of Indian Constitution, Preamble of Constitution- its forms and Importance, Features of Indian Constitution, The nature of Indian Federation.

UNIT II

Fundamental Rights and Directive Principles:
Fundamental Rights- its forms and importance, Fundamental rights in Constitution, Evaluation of Fundamental rights, Fundamental duties, Directive Principles of State Policies (Meaning, Objectives and Source), Classification of Directive Principles, Implementation of Directive Principles.

UNIT III

Composition and Structure of Parliament:
Function of Parliament, Law making Procedure, Executive Council structure and Role, State assembly, Changing Trends of Parliament.

UNIT IV

Judiciary and Election Commission:
Forms of Judiciary, Power, Function and Role of Supreme Court, Judicial Review, Judicial Activism, Structure, Function and Role of Election Commission, Electoral System and Reforms in it.

UNIT V

Socialism of Constitution:
Provision for Women Empowerment, Protection of Rights of Backward Class, Special Provision for Scheduled Tribes, Protection of Rights of workers, Socialistic democracy,
Democracy in India: Challenges, Constitutional Institutions and their role, Lokpal and Lokayukt, State Central Relation, Important Amendments, Nationalism, Criminalisation of Politics.

Text Books:

1. D. Basu, ***"Introduction to the Constitution of India"***, Lexis Nexis Publishers, 23rd edition, 2018.
2. B. Shiva Rao (Editor), ***"Framing of Indian's Constitution, Select Documents"***, Vol. 1, 2015.

Reference Books:

1. T. K. Tope, ***"Constitutional Law of India"***, Sujata V. Manohar (Editor), Eastern Book Company, 3rd edition, 2010.
2. Sir Ivor Jennings, ***"Some Characteristics of Indian Constitution"***, Geoffrey Cumberlege Publishers, 1953.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Design and Analysis of Algorithms Lab**	**Semester:**	**IV**
Course Code:	**BTITL407**	**Course Type:**	**Compulsory**
Pre-requisite:	**Data Structures and Applications Lab**	**L – T – P:**	**0 – 0 – 2**
Stream:	**Core**	**Credits:**	**1**

Lab Experiments List:

1. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n and record the time taken to sort.
   The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and conquer method works along with its time complexity analysis: worst case, average case and best case.
2. Implement the Knapsack problem using Greedy method.
3. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program.
4. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm.
5. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
6. Write programs to Implement All-Pairs Shortest Paths problem using Floyd's algorithm
7. Design and implement a program to find a subset of a given set S = Sl, S2,.....,Sn of n positive integers whose SUM is equal to a given positive integer d. For example, if S = 1, 2, 5, 6, 8 and d = 9, there are two solutions 1,2,6 and 1, 8. Display a suitable message, if the given problem instance doesn't have a solution.
8. Write a program to implement string matching algorithm.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Digital Logic and Microprocessor Lab**	**Semester:**	**IV**
Course Code:	**BTITL408**	**Course Type:**	**Elective**
Prerequisite:	**Nil**	**L – T – P:**	**0 – 0 – 2**
Stream:	**Professional Core**	**Credits:**	**1**

Lab Experiments List for Digital Logic:

1. Verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, & EX-NOR).
2. Design and implement following code conversion:
   (a) Binary to Gray (b) Gray to Binary (c) Excess 3 codes to BCD (d) BCD to Excess 3 codes.
3. Design and verify a half adder and full adder.
4. Implementation of Multiplexer, Demultiplexer, Encoder and Decoder.
5. Study of flip flops:
   (a) RS flip flop (b) JK flip flop **(**c) D flip flop (d) T flip flop and applications of flip flop for counter design.

Lab Experiments List for Microprocessor:

1. 8085 and 8086 kit familiarization and basic experiments.
2. Arithmetic operation of 16-bit binary numbers.
3. Programming exercise: sorting, searching and string.
4. 8255 interfaces to 8086.
5. Assembly language programming of 8051.

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Course Title:	**Web Technology Lab**	**Semester:**	**IV**
Course Code:	**BTITL408**	**Course Type:**	**Elective**
Prerequisite:	**Nil**	**L – T – P:**	**0 – 0 – 2**
Stream:	**Professional Core**	**Credits:**	**1**

Lab Experiments List:

1. Download XAMPP or WAMPP server, IDE, browsers to run HTML program.
2. Develop page to display fruits list with different color with heading on top of the page and link each fruit with fruit description page.
3. Develop using semantic element, page having menu bar in header section.
4. Develop user personal info form using HTML5 input control and decorate with CSS.
5. Develop responsive page layout using media queries.
6. Write a PHP program to print list of user info using array.
7. Write a PHP program to fetch user info from MYSQL database.
8. Write a PHP program to perform crud operation.
9. Write a PHP function to check palindrome string.
10. Write a PHP program using for loop to add all the integers between 0 and 30 and display the total.
11. Create a script to construct the pyramid of asterisk ('*') using nested for loop.
12. Write a program to calculate factorial of a number using for loop.
13. Write a program which will count the specific characters in the text.
14. Debug web site using developer tools, inspect element.

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Course Title:	**Physics of Engineering Materials Lab**	**Semester:**	**IV**
Course Code:	**BTITL408**	**Course Type:**	**Elective**
Prerequisite:	**Engineering Physics Lab**	**L – T – P:**	**0 – 0 – 2**
Stream:	**Professional Core**	**Credits:**	**1**

Lab Experiments List:

1. Crystallite size of nanomaterial's using XRD.
2. B-H loop experiment.
3. Susceptibility measurement.
4. Resistivity of materials by four probe method.
5. Hall effect- determination of carrier concentration.
6. G.M. Counter: Study of Nuclear Counting Statistics.
7. Dielectric constant measurement.