Syllabus for
B. Tech 1st, 2nd and 3rd Year
2023 Admission Batch

Computer Science Engineering

(Approved by Academic Council and Board of Studies)

GIFT Autonomous College
(Approved by AICTE, New Delhi, Affiliated to BPUT, Rourkela)
Recognized under section 2(f) of the UGC act, 1956
At. Gramadiha, Po. Gangapada, Via. Janla, Dist- Khorda, Pincode: 752054

1st Year Course Structure

First Semester

Theory

Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	BS	BTBS-T-BS-101	Mathematics I	4-0-0	3
2	BS	BTBS-T-BS-102/ BTBS-T-BS-103	Elements of Engineering Physics / Applied Chemistry	4-0-0	2
3	ES	BTBS-T-ES-101/ BTBS-T-ES-102	Basic Electrical Engg./ Basic Electronics Engg.	3-0-0	2
4	ES	BTBS-T-ES-103	Basic Programming Skills	4-1-0	3
5	ES	BTBS-T-ES-104/ BTBS-T-ES-105	Basic Mechanical Engg/ Basic Civil Engineering	3-0-0	2
6	HS	BTBS-T-HS-101	English for Engineers-I	2-0-0	1
7	MC	BTBS-T-MC-101/ BTBS-T-MC-102	IT & IS /Constitution of India	2-0-0	0
			Total Hours/ Credit **(Theory)**	23	13

Practical

1	BS	BTBS-P-BS-102/ BTBS-P-BS-103	Elements of Engineering Physics Lab/ Applied Chemistry Lab	0-0-2	1
2	ES	BTBS-P-ES-101/ BTBS-P-ES-102	Basic Electrical Engg. Lab/ Basic Electronics Engg. Lab	0-0-2	1
3	ES	BTBS-P-ES-103	Basic Programming Skill Lab	0-0-3	1.5
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Basic Mechanical Engg lab/ Basic Civil Engineering lab	0-0-2	1
5	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Engineering Graphics with AutoCAD / Workshop Practice-I	0-0-3	1.5
6	HS	BTHS-P-HS-101	English for Engineers Lab-I	0-0-2	1
7	PS	BTPS-P-PS-101	Project - I	0-0-2	1
			Total Hours/ Credit (Practical)	16	8
			Grand Total Hours/ Credit (Practical)	**39**	**21**

Second Semester

Theory

Sl. No.	Category	Course Code	Course Title	WCH L-T-P	Credit
1	BS	BTBS-T-BS-201	Mathematics II	4-0-0	3
2	BS	BTBS-T-BS-102/ BTBS-T-BS-103	Elements of Engineering Physics / Applied Chemistry	4-0-0	2
3	ES	BTBS-T-ES-101/ BTBS-T-ES-102	Basic Electrical Engg/ Basic Electronics Engg./	3-0-0	2
4	ES	BTBS-T-ES-203	Programming Using Data Structure	4-1-0	3
5	ES	BTBS-T-ES-104/ BTBS-T-ES-105	Basic Mechanical Engg/ Basic Civil Engineering	3-0-0	2
6	HS	BTBS-T-HS-201	English for Engineers-II	2-0-0	1
7	MC	BTBS-T-MC-101/ BTBS-T-MC-102	IT & IS /Constitution of India	2-0-0	0
			Total Hours/ Credit **(Theory)**	23	13

Practical

1	BS	BTBS-P-BS-102/ BTBS-P-BS-103	Elements of Engineering Physics Lab/ Applied Chemistry Lab	0-0-2	1
2	ES	BTBS-P-ES-101/ BTBS-P-ES-102	Basic Electrical Engg. Lab/ Basic Electronics Engg. Lab	0-0-2	1
3	ES	BTBS-P-ES-203	Programming Using Data Structure Lab	0-0-3	1.5
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Basic Mechanical Engg lab/ Basic Civil Engineering lab	0-0-2	1
4	ES	BTBS-P-ES-104/ BTBS-P-ES-105	Engineering Graphics with AutoCAD / Workshop Practice-I	0-0-3	1.5
5	HS	BTBS-P-HS-201	English for Engineers Lab-II	0-0-2	1
6	PS	BTPS-P-PS-201	Project - II	0-0-2	1
			Total Hours/ Credit (Practical)	16	8
			Grand Total Hours/ Credit (Practical)	**39**	**21**

CURRICULUM STRUCTURE

Gandhi institute For Technology (GIFT), Autonomous

BTECH – CSE, SYLLABUS- Batch--2023-24, SECOND YEAR

THIRD SEMESTER					
Sl. No.	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	BS	BTBS-T-BS-303	Mathematics for Computer Science	3-0-0	3
2	PC	BTCS-T-PC-301	Database Management System	3-0-0	3
3	OE	BTEC-T-OE-301	Digital Logic Design	3-0-0	3
4	HS	BTBS-T-HS-301	Organizational Behavior	3-0-0	3
5	ES	BTCS-T-ES-301	Object Oriented Programming JAVA	1-0-0	3
6	AE	BTSC-T-AE-301	Ability Enhancement Training -B	1-0-0	1
7	MC	BTMC-T-MC-302	Environmental Engineering	1-0-0	0
Total Credit (Theory)					**16**
Practical					
1	PC	BTCS-P-PC-301	Database Management System Lab	0-0-3	1
2	OE	BTEC-P-OE-301	Digital Logic Design Lab	0-0-3	1
3	EC	BTCS-P-ES-301	Object Oriented Programming Lab	0-0-3	1
4	PS	BTCS-P-PS-301	SEMINAR-1	0-0-2	1
5	SC	BTSC-P-SC-301	Evaluation of Summer Internship -I	0-0-2	2
Total Credit (Practical)					**6**
Total Semester Credit					**22**

FOURTH SEMESTER					
Sl. No.	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	PC	BTCS-T-PC-401	Design and Analysis of Algorithms	3-0-0	3
2	PC	BTCS-T-PC-402	Computer Organization & Architecture	3-0-0	3
3	PC	BTCS-T-PC-403	Programming With Python	3-0-0	3
4	HS	BTBS-T-HS-401	Engineering Economics and Costing	2-0-0	3
5	OE	BTEC-T-OE-401	Digital Signal Processing	3-0-0	3
6	OO	BTCS-T-OO-401	NPTEL Course	1-0-0	2
7	AE	BTSC-T-AE-401	Ability Enhancement Training -C	1-0-0	1
8	MC	BTMC-T-MC-302	Essence of Indian knowledge and tradition	1-0-0	0
Total Credit (Theory)					**18**
Practical					
1	PC	BTCS-P-PC-401	Design and Analysis of Algorithms Lab	0-0-3	1
2	PC	BTCS-P-PC-402	Computer Organization & Architecture Lab	0-0-3	1
3	PC	BTCS-P-PC-403	Programming With Python Lab	0-0-3	1
4	PS	BTCS-P-PS-401	Project-III	0-0-2	2
Total Credit (Practical)					**5**
Total Semester Credit					**23**

CURRICULUM STRUCTURE

Gandhi institute For Technology (GIFT), Autonomous

BTECH CSE, SYLLABUS - Batch--2023-24, THIRD YEAR

FIFTH SEMESTER					
Sl. No.	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	**PC**	**BTCS-T-PC-501**	Artificial Intelligence	3-0-0	3
2	**PC**	**BTCS-T-PC-502**	Software Engineering	3-0-0	3
3	**PC**	**BTCS-T-PC-503**	Operating Systems	3-0-0	3
4	**PC**	**BTCS-T-PC-504**	Formal Language and Automata Theory	3-0-0	3
5	**PE**	**BTCS-T-PE-501**	Web Design and Development	3-0-0	3
6	**AE**	**BTCS-T-AE-501**	Ability Enhancement Training -D	2-0-0	1
7	**MC**	**BTCS-T-MC-501**	Essence of Indian knowledge and Tradition - II	2-0-0	0
Total Credit(Theory)					**16**
Practical					
1	**PC**	**BTCS-P-PC-501**	Artificial Intelligence Lab	0-0-2	1
2	**PC**	**BTCS-P-PC-502**	Software Engineering Lab	0-0-2	1
3	**PC**	**BTCS-P-PC-503**	Operating Systems Lab	0-0-2	1
4	**PS**	**BTCS-P-PS-501**	SEMINAR-2	0-0-2	1
5	**PS**	**BTCS-P-PS-502**	Evaluation of Summer Internship -II	0-0-2	1
Total Credit(Practical)					**5**
Total Semester Credit					**21**

SIXTH SEMESTER					
Sl. No.	**Category**	**Course Code**	**Course Title**	**L-T-P**	**Credit**
1	**BS**	**BTCS-P-BS-601**	Optimization Engineering	3-1-0	4
2	**PC**	**BTCS-T-PC-601**	Computer Network	3-0-0	3
3	**PC**	**BTCS-T-PC-602**	Compiler Design	3-0-0	3
4	**PC**	**BTCS-T-PC-603**	Machine Learning	3-0-0	3
5	**OE**	**BTCS-T-OE-601**	Green Technology	3-0-0	3
6	**OO**	**BTCS-T-OO-601**	NPTEL Course	0-1-0	2
7	**SC**	**BTCS-T-SC-601**	Ability Enhancement Training -E	2-0-0	1
8	MC	**BTCS-T-MC-601**	Universal Human Values	2-0-0	0
Total Credit(Theory)					**19**
Practical					
1	**PC**	**BTCS-P-PC-601**	Computer Network Lab	0-0-2	1
2	**PC**	**BTCS-P-PC-602**	Compiler Design Lab	0-0-2	1
3	PC	**BTCS-P-PC-603**	Machine Learning Lab	0-0-2	1
4	**PS**	**BTCS-P-PS-601**	Project-IV	0-0-4	2
Total Credit(Practical)					**5**
Total Semester Credit					**24**

Program Outcomes (UG Engineering)

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The Program Outcomes (POs) for UG Engineering programs defined by NBA are:

PO1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. **Problem Analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibility relevant to the professional engineering practice.

PO7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

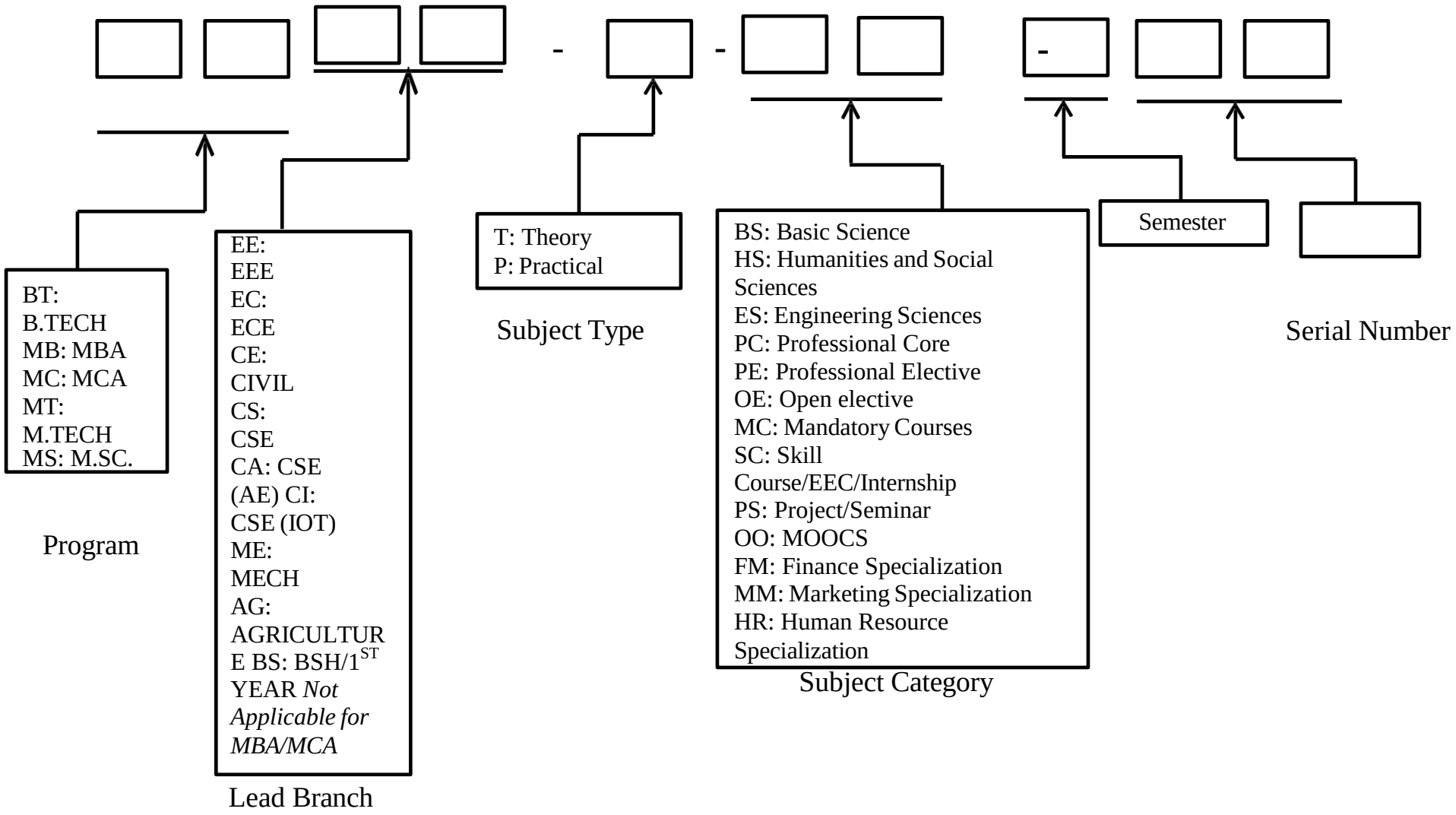
PO11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Types & Definitions

L	Lecture
T	Tutorial
P	Laboratory / Practical / Sessional
WCH	Weekly Contact Hours
BS	Basic Sciences
HS	Humanities & Social Sciences (including Management)
ES	Engineering Sciences
PC	Professional Core
PE	Professional Elective
OE	Open Elective
MC	Mandatory Course
SC	Skill Course
EEC	Employment Enhancement Course
SEPD	Skill Enhancement and Personality Development

Subject Code Format



Evaluation process

1. **Evaluation Process of Theory Subjects:**

Internal Examination (B. Tech, Autonomous)					
Sr No	**Type of Test**	**Mark**	**Frequency**	**Total Mark**	**Reduced Mark**
1	Modular Test	25	3	75	**50**
2	Online Quiz Test	10	6	60	**10**
3	Assignment	10	2	20	**10**
4	Subject Specific Project	15	1	15	**15**
5	Attendance	15	1	15	**15**
TOTAL				155	**100**
Pass Mark					**45**

Proposed External Examination (B. Tech, Autonomous)				
Sr No	**Type of Test**	**Mark**	**Frequency**	**Total Mark**
1	End Semester Examination	100	1	**100**
Pass Mark				**35**

2. **Evaluation Process of Practical Subjects:**

Components	**Marks**	**Frequency**	**Assigned To**
Attendance	10	Closing of Instruction	To be retrieved from CMS
Daily Performance & Viva-voce	40	On the day of Experiment	Concerned Faculty (Upload in CMS in weekly basis)
Lab Record	20	On the day of Experiment	Concerned Faculty
End-Semester Lab Test	30	1	At the end of the semester as per the schedule published by Examination Cell
Total	**100**		

3. Process of Skill Courses:

Evaluation

Components	Marks	Frequency	Assigned To
End-Semester Examination	100	1	Examination Cell/ Concerned Faculty
Total	**100**		

4. Evaluation Process of Mandatory Courses:

Components	Marks	Frequency	Assigned To
In-Semester Evaluation	100	1	Examination Cell/ Concerned Faculty
Total	**100**		

Contents

First Year B.Tech

Curriculum Structure

B.Tech (1st Semester & II nd Semester)

Type	Code	Mathematics - I	L-T-P	Credits	Marks
BS	BTBS-T-BS-111		4-1-0	3	150

Objectives	The objective of this course is to familiarize the students with the knowledge and concepts of ordinary differential equations and applications, solution of system of linear equations using matrix, Eigen vectors & Eigen values of matrices with applications.
Pre-Requisites	A good knowledge of trigonometry along with basics of differential and integral calculus of one variable and coordinate geometry of two and three dimensions.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module	Topics	Hours
Module-1	Solution of first order differential equations, Linear equation, Bernoulli's equation. Second order differential equations with constant coefficients, Euler-Cauchy equation. Experiential learning-Applications of differential equations in 2D using MATLAB.	**12 Hours**
Module-2	Introduction to vector space, sub space, linearly independent and linearly dependent vectors, solution of system of linear equations, Gauss elimination, and Gauss-Jordan methods, Determinant, Inverse of a matrix, Rank of a matrix. Basics of linear transformation, Eigen values and Eigen vectors. Experiential learning- Blending system of linear equations in Gauss elimination method, Computation of Eigen values and Eigen vectors using MATLAB.	**13 Hours**
Module-3	Vector Differential Calculus: Vector and Scalar functions and Fields, Derivatives, Curves, Tangents and Arc length, Gradient, Divergence and Curl with applications.	**8 Hours**
Module-4	Average, Problems on Ages, Percentage, Profit and Loss, Ratio and Proportion, Time and Work, Time and Distance, Simple and Compound Interest.	**12 Hours**
	Total	**45 Hours**

Text Books:

T1. E. Kreyszig, Advanced Engineering Mathematics, Wiley India.
T2. B. V. Raman, Higher Engineering Mathematics, Mc Graw Hill Education Pvt. Ltd.
T3. R. S. Aggarwal, Quantitative Aptitude For Competitive Examinations, S. Chand publication.

Reference Books:

R1. S. Pal and S. C. Bhunia, Engineering Mathematics, Oxford University Press.
R2. P. V. O'Neil, Advanced Engineering Mathematics, Cengage Learning.
R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.
R4. A. Sharma, Quantitative Aptitude, Mc Graw Hill Education Pvt. Ltd
R5. R. Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Wiley Publication

Online Resources:

1. https://nptel.ac.in/courses/111106100
2. https://nptel.ac.in/courses/111105121
3. https://nptel.ac.in/courses/111104137
4. https://nptel.ac.in/courses/111107108
5. https://nptel.ac.in/courses/111106051
6. https://nptel.ac.in/courses/111105134

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

CO1	Find the general solution of first and second order ordinary differential equations and use the general solution to find the specific solution for given initial value problems.
CO2	Solve and demonstrate various physical models through second order differential equations.
CO3	Use the understanding of matrix algebra to solve systems of linear equations, harmonics problems, population models etc. arising in various engineering fields.
CO4	Demonstrate knowledge and applications of Eigen value problems related to engineering disciplines.
CO5	Application of mathematics for engineers through MATLAB.
CO6	Know the basic concepts of quantitative aptitude to meet real life requirements.

Type	Code		L-T-P	Credits	Marks
BS	BTBS-T-BS-102	**Elements of Engineering Physics**	4-0-0	2	150

Objectives	1. To expose students to the fundamental principles and laws of mechanics in Physics to understand the types of motion. 2. To analyze the concepts of mechanics, oscillations, waves and optics to prepare the students for advanced level courses. 3. To demonstrate the ability to identify and apply the appropriate analytic, numerical, and mathematical reasoning, to situations of the physical world. 4. To adaptability to new developments in science and technology.
Pre-Requisites	Class 12^{th} level Physics course
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Oscillation, waves and Mechanical Properties** Simple, damped and forced oscillations, resonance, coupled oscillations. Wave and wave equation, Superposition of waves. Interference, Young's double slit experiment, Newton's rings, Diffraction, Fraunhofer diffraction by single slit, Diffraction Grating, Polarization, Malus' Law, Brewster's Law. Mechanical Properties of Matter Stress, strain, Hooke's law, elastic constants and their relations, stress-strain diagrams **Experiential learning:- Different Types of Oscillator circuits (Using inductor and capacitor frequency will be determined)**	**12 Hours**
Module-2	**Electromagnetism and Concept of Quantum mechanics** Divergence, Curl and Gradient, Line, Surface and volume integral, Gauss divergence theorem, Stokes theorem (Only Statements, no proof), Gauss's law, Ampere's law and Faraday's law of electromagnetic induction, Maxwell's equations in integral and differential form. Black body radiation, Planck's law, photo electric effect (concept and equation), Matter waves, de Broglie hypothesis, Heisenberg's Uncertainty Principle and its application, Schrodinger's wave equation – Time independent and Time dependent equations, Free particle, Particle in a one dimensional rigid box. **Experiential learning:-Soft image using quantum Machine learning Algorithm**	**10 Hours**

Module-3	**Engineering Materials** Semiconducting Material: Defects in solids (Elementary idea)**,** Concept of energy bands in solids, carrier concentration and conductivity in semiconductors with temperature dependence, construction and working of PN junction diode. Dielectric materials, Dielectric Polarization, Dielectric Breakdown, Dielectric constant and loss, Electromagnetic wave in dielectric medium. Superconducting materials: Superconductivity, Critical parameters, Meissner effect, Type I & Type II superconductors, BCS theory, applications of super conducting materials. Nano material: Classifications, Quantum confinement, surface to volume ratio, Graphene and its structure, Application. **Experiential learning: Magnetic energy storage devices, Construction of battery and diode.**	**10 Hours**
Module-4	**Quantum Statistics and Optoelectronic devices** Statistical Mechanics: Statistical distributions: Maxwell-Boltzmann, Molecular Energies in an ideal gas, Bose-Einstein and Fermi-Dirac statistics. Laser: Spontaneous and stimulated emission, Einstein's coefficients, Population inversion, Light amplification, Basic laser action, Types of laser, Ruby and He-Ne lasers, applications. Fiber Optics: Optical fiber and its principle, acceptance angle, numerical aperture for step and graded index fibers, attenuation mechanism in optical fibers, applications of optical fibers. **Experiential learning: Optical fiber communication, LED** **Design different types of sensors using optical fiber.**	**12 Hours**
Total		**44 Hours**

Text Books:

T1. Principles of Engineering Physics-Vol. I and II by M. Khan & S. Panigrahi, Cambridge university Press
T2. Physics for Engineering degree students, B. B Swain & P. K Jena.

Reference Books:

R1. Electronic Devices and Circuits - Millman, Halkias and Jit, Tata McGraw Hill
R2. Concepts of Modern Physics : A Beiser, S Mahajan, S. Raichoudhury
R3. Optics: A. K. Ghatak
R4. Introduction to Solid State Physics: S. O. Pillai
R5. Properties of matter: D. S. Mathur
R6. Heat and Thermodynamics: N Subramaniam

Online Resources:

1. https://nptel.ac.in/courses/122106027
2. https://nptel.ac.in/courses/115105121
3. https://onlinecourses.nptel.ac.in/noc22_ph06/preview
4. https://nptel.ac.in/courses/115105097
5. https://nptel.ac.in/courses/108106161

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

CO1	Understand the concepts of waves, oscillation and its significance.
CO2	Acquire skills to apply formulas of optics and wave physics.
CO3	Gain Acquire Knowledge of basic concepts of electric and magnetic fields.
CO4	Develop the concept of different engineering material and their applications.
CO5	Understand the basic knowledge of thermodynamic and use them to solve practical problems.
CO6	Develop a comprehension of the current basis of broad knowledge in Modern physics.

Type	Code		L-T-P	Credits	Marks
BS	BTBS-T-BS-103	**Applied Chemistry**	4-0-0	2	150

Objectives	The objective of this course is to make students learn about basic concepts and application of Chemistry from Industrial, Pharmaceutical, research, agriculture and life science point of view.
Pre-Requisites	A fundamental knowledge of Quantum, Inorganic chemistry, along with basics of Periodic table, properties of metal are to be clear.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Quantum Mechanics and its application**: Failure of classical mechanics and introduction to quantum mechanics, Photoelectric effect, Postulates of Quantum mechanics, Schrodinger's wave equation (Derivation not required), Particle in One dimensional box, Significance of eigen value and eigen function. Zero point energy. **Phase rule and its application**: Definition of phase, component and degree of freedom ,one component system, Water, Sulphur system, Curves and triple points, meta stable triple point, Two component alloy systems: Bi-Cd, eutectic point **Experiential learning:- Preparation of alloys, Isolation of Salts from Mixtures (By adjusting Temperature and Composition)**	**12 Hours**
Module-2	**Electro Chemistry and its application**: Electro chemical cells, Dry cell, Alkaline battery, Ni-Cd battery, Li-ion Battery, Pb-acid storage cell **Fuel Cells:** Definition, Different types of fuel cell, Hydrogen blue fuel cell, FCEVs **Corrosion**: Theory and mechanism of corrosion, Types, differential aeration corrosion, water line corrosion, Pitting, stress, SCC, galvanic corrosion, Caustic embrittlement, Factors affecting corrosion, Corrosion Control, corrosion inhibitors: Cathodic protection, Metal coatings. **Experiential learning:- Preparation of dry cell (Using metal ,carbon rod and insulating Separator)**	**13 Hours**

Module-3	**Fuel**: Classification, calorific value, refining of crude oil, cracking, fuel for I/C engine, knocking, anti-knocking, Octane rating. Diesel engine fuels, Cetane rating, Combustion calculations. Gaseous fuel: LPG, CNG, Biogas fuel, Alternate Fuels, carbon foot print, carbon trading **Polymer**: Degree of polymerization, Thermosetting and thermoplastic polymer with examples: Polethene, PVC, Nylon-6, Teflon and their applications, Rubber: Natural rubber, Vulcanized rubber. **Experiential learning:- Preparation of Hexamethyelene diamine Adipic Acid(Nylon 66) Polymer. (Using Adipoyl Chloride)**	**12 Hours**
Module-4	**Nano materials**: Introduction, Classification, characteristics, 0D,1D, 2D Nanomaterials, Synthesis: Top Down & Bottom Up approach, Application to Pharmaceutical and Research . **Experiential learning:- CNTs are synthesized by thermal CVD method using hydrocarbon gas as carbon source (Using Quartz tube and RF heater)**	**8 Hours**
Total		**45 Hours**

Text Books:

T1.Theory & Practical's of Engineering Chemistry, By Shashi Chawla, Publisher: Dhanpati Rai & CO.(Pvt.) Ltd

T2. Engineering Chemistry Vol-I & II, Author: Jain & Jain, Publisher: Dhanpati Rai Publishing Company.

T3. Engineering Chemistry, Author: Prasant Rath, 2015, Cenage Learning India Pvt, Ltd

T4. Textbook on Engineering chemistry. Author: Achyutananda acharya & Biswit Samantaray, publisher: Pearson

Reference Books:

R1. Theory & practical's of engineering chemistry, by Shashi Chawla, publisher: Dhanpati Rai & CO.(Pvt.) Ltd

R2. Engineering chemistry vol-i & II, author: Jain & Jain, publisher: Dhanpati Rai publishing company.

R3. A textbook of engineering chemistry, author: Dr. Rajshree Khare publisher: S.K. Kataria & sons.

R4. Textbook of nanoscience and nanotechnology. Mcgraw Hill Education (India) Pvt. Ltd., 2012.

R5. Nanostructures & Nanomaterials: synthesis, properties and applications- g. Cao and Y. Wang, world scientific Pvt. Ltd.; 2nd edition

Online Resources:

1. https://www.energy.gov/eere/fuelcells/fuel-cells
2. https://www.britannica.com/science/polymer
3. https://www.niehs.nih.gov/health/topics/agents/sya-nano/index.cfm
4. https://afdc.energy.gov/vehicles/fuel_cell.html
5. https://www.researchgate.net/publication/258761372

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

CO1	Describe graphs of one and two component system (curves) and their characteristics.
CO2	Solve quantum energy related problem and determine the quantized energy of different energy levels.
CO3	Explain the methodology of corrosion occurrence in different cases and its prevention to optimum level.
CO4	Explore the concepts and methods of blending of fuels with better Cetane and Octane number.
CO5	Use the concept of Polymer Synthesis, Nano material synthesis methodologies and types of nanomaterial.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-101	**Basic Electrical Engineering**	3-0-0	2	150

Objectives	To expose to the field of electrical &electronics engineering, and to acquire the fundamental knowledge in the field.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Electrical power system: An overview of Electrical Engineering, Sources of energy, steam, hydro and nuclear power generation, Renewable source of Power generation and general structure of electrical Transmission**,** Distribution, and Utilization & Conservations. DC Circuits: Study of Electrical Elements (R, L, C). Ohm's Law. Series & Parallel combination. KCL, KVL, Nodal & Mesh analysis. Star Delta Conversion. Superposition theorem, Thevevnin's theorem, **Experiential learning:-** **Power generating station (Construction of Small hydro plant, Biomass plant)** **LED light using solar energy.**	**10 Hours**
Module-2	AC fundamentals: Sinusoidal Wave form, Peak, RMS, Average value. Concept of Real Power, Reactive Power, Apparent Power &Power factor. Analysis of 1-phases AC circuit. Introduction to 3- phase system. Line & Phase quantity in star and delta connection, Analysis of 3- phases balanced AC circuit. Concept of resonance in series and parallel R-L-C circuits. Magnetic circuits: Electro magnetism, simple magnetic circuit, magnetic material, B-H curve. **Experiential learning:-** **Design of Magnetic Circuits to learn self induction & Mutual inductance.**	**12Hours**
Module-3	Electrical Machines: Construction, working principle & Application of DC generator, DC Motor, 3 phase & single phase induction motor, Alternator & Special Motors (Stepper & **BLDC**) **Experiential learning:-** **Single phase transformer construction and working:** ➢ **Definition of Transformer, construction of Winding of shell type Transformer.**	**8 Hours**

Module-4	Electrical Installations & wiring: Layout of LT switchgear, Switch fuse unit (SFU), MCB, ELCB, MCCB. Type of earthing & Different types of Domestic Wiring. **Experiential learning:-** **Design of Electric Circuit using Circuit Breaker & Fuse for domestic house wiring.** Electrical Safety: Safety Procedure for working on electrical mains & Apparatus, Electrical hazard, its preventions & Protections, Fire preventions & protection for electrical installations. First aid in electrical Injuries. Artificial respiration & chest compression for accidents victims. Importance of IE rules and Electrical License rules. Different Illumination, Batteries and their applications. **Experiential learning:-** **Making of LED bulb and Determination of Ratings of Different types of Lamps. (Tungsten, Mucury Vapour, CFL & LED)**	**10 Hours**
Total		**40 Hours**

Text Books:

T1.D. P. Kothari and I. J. Nagrath, " Basic Electrical Engineering", Tata McGraw Hill.

T2. Principles of Electrical Safety, Peter E. Sutherland, Wiley-IEEE Press.

Reference Books:

R1."Basic Electrical Engineering" by Mittle, V and Arvind Mittle, Tata McGraw Hil.

R2.E. Hughes, "Electrical and Electronics Technology", Pearson.

R3. Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand.

R4."Basic Electrical Engineering" by C L Wadhwa, New Age pub.

R5.D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

R6.Electrical Safety Handbook, 4th Edition Hardcover by John Cadick Mary Capelli-Schellpfeffer Dennis Neitzel Al Winfield

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee62
2. https://onlinecourses.nptel.ac.in/noc23_ee17
3. https://onlinecourses.nptel.ac.in/noc23_ee65
4. https://onlinecourses.nptel.ac.in/noc23_ee66
5. https://onlinecourses.nptel.ac.in/noc23_ee15
6. https://onlinecourses.nptel.ac.in/noc22_ee90
7. https://onlinecourses.nptel.ac.in/noc22_ee93

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

CO1	Introduce fundamentals idea & techniques about electrical engineering & to provide knowledge about DC, AC.
CO2	Analyses of different problems of electrical circuit using electrical theorems.
CO3	Understanding of magnetic circuit and solving the basic problems.
CO4	Impart conceptual analysis of electrical machineries & to familiarize the students with electrical safety equipment & domestic wiring.
CO5	Understand and implementation the earthing and wiring system.
CO6	Inculcate sound understanding of illumination scheme.

Type	Code	Basic Electronics Engineering	L-T-P	Credits	Marks
ES	BTBS-T-ES-102		3-0-0	2	100

Objectives	To expose to the field of electronics engineering, and to acquire the fundamental knowledge in the field.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving

Evaluation Scheme

Teacher's Assessment			Written Assessment		Total
Quiz	Surprise Test(s)	Assignment(s)	Mid-Term	End-Term	

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Electronics and Communication Engineering: Basic Electronics components (active, passive),Signal, Spectrum, Frequency Band and Industrial application(VLSI, Microwave, RF, Telecommunication, Fiber Optics, RADAR, Signal Processing). Basic Communication Block Diagram and concept of Transmitter, Receiver and Channel. Diodes: Overview of Semiconductors. Working principle and characteristics of PN junction. **Experiential Learning :** Diode applications (half-wave and full-wave rectifier, clipper, clamper and zener /Avalanche Breakdown).	**10 Hours**
Module-2	Bipolar Junction Transistor :Construction, Operation of Bipolar Junction Transistor and **Experiential Learning :** Transistor Biasing : Fixed Bias, Voltage divider bias, Transistor as a switch, CB, CE, CC (Relationship between α, β, γ) circuit configuration Input-output characteristics, as an Amplifier . Op-Amp:The Operational Amplifier (Op-Amp): The Ideal Op-Amp Characteristics, Virtual ground concept, Inverting and non-inverting configurations, Application of Op-Amp (Summing amplifier, Integrator, Differentiator. Unit Gain Amplifier)	**10 Hours**
Module-3	Basics of Digital Electronics : Number System, Inter conversion of Number Systems,Binary Arithmetic,Boolean Algebra,Simplification of Boolean Expressions,Demorgan's Theorem,SOP,POS, Digital logic Gates (AND, OR, NOT, NAND, NOR, EXOR, EX-NOR); Realization of Basic logic gates using universal gates, Combinational Circuits-Half-Adder, Full-Adder, Half-Subtractor, Full-Subtractor.Basic concept of Sequential Circuits,latch and flip-	**12 Hours**

Module-4	Introduction to Microprocessors and Microcontrollers: Basic block diagram: input, output, ALU, CU, Registers ,Difference between microprocessor and microcontroller. **Experiential Learning :** Introduction to chip designing and manufacturing. Introduction to Sensors and their Applications : Introduction to different types of Sensors: Temperature sensor, Moisture Sensor, Rain Sensor, LDR, IR, Smoke Sensor	**8 Hours**
	Total	**40 Hours**

Text Books:

T1. Electronic Devices and Circuit Theory (Ninth Edition), Robert L. Boylested and Louis Nashelsky, Pearson Education, 482 FIE, Patparganj, Delhi – 110 092.

T2.Digital Design, 5th Edition M. Morris Mano and Michael D Ciletti Pearson

T3.B. Ram, Fundamentals of Microprocessors and Microcomputers, Dhanpat Rai Publications

Reference Books:

R1 Principles of Electrical Engineering and Electronics- V K Mehta, Rohit Mehta, S Chand.

R2.E. Hughes, "Electrical and Electronics Technology", Pearson.

R3.Microelectronic Circuits, 7th Edition Adel S Sedra and Kenneth C Smith Oxford University Press

R4.Fundamentals of Digital Circuits, 4th Edition A Anand Kumar PHI

R5. Integrated Electronics, 2nd Edition Jacob Millman and Christos Halkias Tata McGraw Hills

R6. A course in Electrical and Electronic Measurements and Instrumentation Author: AK Sawhney Publisher : Dhanpat Rai & Co. (P) Limited

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee62
2. https://onlinecourses.nptel.ac.in/noc23_ee17
3. https://onlinecourses.nptel.ac.in/noc23_ee65
4. https://onlinecourses.nptel.ac.in/noc23_ee66
5. https://onlinecourses.nptel.ac.in/noc23_ee15
6. https://onlinecourses.nptel.ac.in/noc22_ee90
7. https://onlinecourses.nptel.ac.in/noc22_ee93

CO1	To introduce fundamentals idea & techniques about electrical engineering & to provide
CO2	To impart conceptual analysis of electrical machineries & to familiarize the students with electrical safety equipment & domestic wiring.
CO3	To inculcate sound understanding of illumination scheme.
CO4	To give knowledge about basic electronic components , industrial applications and
CO5	To understand basic operation and applications of Diode, BJT and Op-Amp.
CO6	To Study basic digital concepts, sensors , microprocessors and microcontrollers

Type	Code		L-T-P	Credits	Marks
ES	BTES-T-ES-103	**Basic Programming Skills**	4-1-0	3	150

Objectives	To expose to the field of Problem Solving and Programing
Pre-Requisites	Knowledge of Mathematics in Secondary Education
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Algorithm, Representation of Algorithm: Flowchart/Pseudo-code with examples. From algorithms to programs; C Program source code, C Program structure, basic syntax, data types, variables, constants, storage class, syntax and logical errors in compilation, object and executable code, Arithmetic expressions, operators and precedence.	**10 Hours**
Module-2	Decision making: Conditional Branching, if statement, if else statement, nested if else statement, switch, nested switch statements, Iteration and loops, break, continue, Decision making Application in solving real life problems.	**8 Hours**
Module-3	Functions, Parameter passing in functions, call by value, idea of call by reference, recursion with examples of Finding Factorial, Fibonacci series, local and global variables, static variables. **Experiential Learning:** Arduino based Programming: Overview of the Arduino UNO Components, Analog and Digital Read, Controlling output	**8 Hours**
Module-4	Arrays: Arrays (1-D, 2-D), initialization, Accessing Array Elements, Matrix applications, passing arrays to functions, Character arrays and Strings, Pointers, Pointer arithmetic, dynamic memory allocation, pointer to array and array of pointers, Linear Search, Bubble Sort	**8 Hours**
Module-5	Structures, Array of structures, union, structure vs union, passing structure to function, File handling: ASCII and binary Files.	**6 Hours**
Total		**40 Hours**

Text Books:

1. E. Balagurusamy, Programming in ANSI C, 8th Edition, Tata McGraw Hill, 2019
2. Herbert Schild, C: The Complete Reference, Tata McGraw Hill

Reference Books:

1. A.K.Rath and A. K. Jagadev, "Data Structures and Program Design using C", 2nd Edition, Scitech Publications, 2011
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication Pvt. Ltd
3. Rajaraman, V., Computer Programming in C, PHI Publications
4. Simon Monk, Programming Arduino: Getting Started with Sketches, 2nd Edition, McGraw Hill, 2016
5. Yashavant Kanetkar, Let Us C, 17th Edition, BPB Publications New Delhi, 2019

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

CO1	To formulate simple algorithms for problem solving and translate the algorithms to programs.
CO2	To test and execute the programs and correct syntax and logical errors.
CO3	To implement different conditional branching and loops for problem solving.
CO4	To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
CO5	To use arrays, pointers and structures to formulate algorithms and programs.
CO6	To apply programming to solve searching and sorting problems.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-104	**Basic Mechanical Engineering**	3-0-0	2	150

Objectives	To expose to the field of Mechanical Engineering, and to acquire the fundamental knowledge in the said field.
Pre-Requisites	Knowledge of Physics, Mathematics and computer programming in Secondary
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on group task, project planning and video

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction to Engineering Materials and Mechanical Measurement:** **Engineering Materials:** Classification of engineering material, Properties-Physical, Chemical & Mechanical, Composition of Cast iron and Carbon steels, Alloy steels their applications, Composites, Plastics and ceramics. Concepts on Metallurgy. Smart materials. **Mechanical Measurement:** Concept of measurements, errors in measurement, measurement of Temperature, Pressure, Velocity, and Flow. (Working principle only.) Experiential learning 1. Preparation of Composite material	**8 Hours**
Module-2	**Introduction to Manufacturing Processes** History of industrial revolution, introduction to **Casting:** Sand casting, Die casting, investment casting; centrifugal casting; **Metal joining**: Soldering, Brazing and Welding, **Metal forming**: bulk metal forming (rolling, forging, extrusion, wire/bar drawing), sheet metal forming(bending, deep drawing, sheering), **Additive Manufacturing:** Introduction to 3d printing: working principle,physics of process; process modelling: computer aided process planning for 3d printing; classification: Extrusion(Detail study of Fused Deposited Modelling with video demonstration of working principle of in-house 3d printer), granular,laminated, light polymerized ; Related technologies. **Subtractive Manufacturing(working principle, details of machine tools and application only):** Introduction, Conventional Machining Processes: cutting,turning, milling, drilling, grinding, and boring; Non-conventional Machining Processes: CNC Machining, EDM, ECM,Laser Cutting, Wood router(Detail study and video demonstration of working principle),water jetting. Experiential learning 2. Wood carving of Art CAM using wood router 3. Small project using Metal joining process(Similar and Dis-similar) 4. Casting of different components	**12 Hours**

Module-3	**Fundamentals of Thermodynamics and Fluid Mechanics:** Basics of Thermodynamics, Steam formation& its properties. Evaporation and Condensation, Cryogenics: Dry ice Vs Liquid Nitrogen. Aircraft engines and its classifications, Fuels, Rockets. Application of Thermodynamics : Steam power plant, I.C Engine, Refrigerators and Air- Conditioners (Brief description of different components with Schematic diagram only.) Fluid Properties and their Applications: Fluid properties, Pascal's Law its application, Archimedes Principle, Bernoulli's theorem. Hydraulic machines: turbines, pumps, their types. CO4: Get knowledge of fluid properties and explain working principle of Hydraulic Machines Experiential learning 5.Hydraulic system design and manufacturing using Pascal's Law	**12 Hours** **13 Hours**
Module-4	Introduction power transmission: Power transmission devices: Belt, Rope, Gear & Gear drives. Coupling, clutch, brakes. (Working principle only), Mechanical Advantage, Velocity ratio. Experiential learning 6.Belt drive , muff coupling	**8 Hours**
	Total	**40 Hours**

Text Books:

T1. Basic Mechanical Engineering by Pravin Kumar, Pearson .
T2. Text book of Elements of Mechanical Engineering, S T Murthy, Universities press.
T3. Cengal, Y., Boles, "Thermodynamics", Mc-Graw Hill, 2001.

ReferenceBooks:

R1. Basic Mechanical Engineering by Basant Agrawal, C M Agrawal,Willey .
R2. Elements of Mechanical Engineering by J K Kittur and G D Gokak,Willey.
R3. Engineering Thermodynamics by P. Chattopadhaya, Oxford University Press.
R4. Basic Mechanical Engineering by .D. Mishra, P.K Parida, S.S.Sahoo, India Tech Publishing.
R5. Engineering Materials, S C Rangwala, Charotar Publishing House .

Course Outcome

At the end of the course the student will be able to:

CO1	Discuss the Properties of Common Engineering Materials and measuring equipment
CO2	Describe the conventional and advanced Manufacturing process.
CO3	Explain the Working Principle of IC engines and Refrigeration and Air conditioning.
CO4	Get knowledge of fluid properties and explain working principle of Hydraulic Machines
CO5	Explain different power transmission systems.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-T-ES-105	**Basic Civil Engineering**	3-0-0	2	150

Objectives	To expose to the field of Civil Engineering, and to acquire the fundamental knowledge in the said field.
Pre-Requisites	Knowledge of Physics, Mathematics and computer programming in Secondary Education
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on group task, project planning and video demonstration .

Detailed Syllabus

Module-#	Topics	Hours
Module-I	**Introduction to Construction materials** Basics of Civil Engineering & Broad disciplines of Civil Engineering Building components and Materials –Cement, Concrete, Steel,. Concept of smart building, Tiles for flooring, Different Types of Doors and windows, Paints. New and smart Materials – flyash, new-age concrete, recycling of materials.	**10 Hours**
Module-II	**Field Survey :** Scale,plan, map, principles of survey, Linear measurements, Ranging, Compass Survey, Bearing of a line, Levelling, Introduction to Modern Survey Instruments (EDM and Total Station), GIS and GPS (Introduction only). **Transportation** Railway , Airport ,Types of Bridges, concept of Tunnels and Metro rail (underground and overhead **engineering** - Different modes of transport, classification of road, , Introduction to), Basics of Port and Harbor, Breakwater – Concept of inland waterways.	**10 Hours**
Module-III	**Fundamentals of Soil Mechanics, Hydrology** Fundamentals of soil classification, properties, foundation (deep and shallow)and types. Fundamentals of Water Resource engineering- sources and Introduction to hydraulic structures like canals, siphons, weirs, dams etc.	**10Hours**

Module-IV	**Water supply (Experiential Learning)** Introduction, sources of water, advantages and disadvantages of water supply, water supply system and its components. Types of flow , Pumps- its types, centrifugal pump its principle, components and its limitations. Pressure Regulator, Working of Pressure Regulator **Sensors:** Introduction, Types of sensor, uses and use of relay in tanks. **Solenoid valve-** Solenoid valve types, Solenoid valves working principle, Advanced plumbing Technologies, Plumbing in Building, Plumbing system, Purpose of plumbing system, Plumbing safety tools, Plumbing tools, Safety during work, Fitting and fixtures in domestic building, Plumbing business tools, Valves, Types of joints **Waste Water Treatment** Sewerage, Characteristics of sewerage, effect of sewerage on ecosystem, waste water treatment, Importance of waste water, its treatment process. Sewerage system, types of sewerage system	**12 Hours**
Total		**42 Hours**

TextBooks:

T1. Basic Civil Engineering, S.Gopi, Pearson.

T2. Basics of Civil Engineering, M.S. Palanichamy, McGraw Hill.

ReferenceBooks:

R1. Surveying Vol -1, RAgor, Khanna Publisher.

R2. Water supply ana Waste water engineering, S.K. Garg.

R3. Introduction to Bridge Engineering, D. Jhonson Victor.

R4. Engineering Materials, S C Rangwala, Charotar Publishing House.

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

CO 1	Identify the different properties of building materials
CO 2	Understanding the different modes of transportation
CO 3	Study of engineering properties of soil
CO 4	Analyze of water supply system by sensors and solenoids
CO 5	Evaluating different types of pumps
CO 6	Explore the uses of different instruments used in civil engineering work

Experiential Learning :

1. Transparent centrifugal pump.
2. Aqueduct, Syphon aqueduct, Super passage, canal syphon , level crossing
3. Practical working model of port

4. Piping connection.
5. Piping network Connection
6. Solenoid Valve
7. Study of different water sensors.
8. Hydraulic bridge
9. Fly-ash Bricks.
10. New age concrete.- ferroconcrete, roller compacted concrete, FRC

Type	Code	English for Engineers –I	L-T-P	Credits	Marks
BS	BTBS-T-HS-111		2-0-0	1	100

Objectives	1. To develop the understanding of communication in different context.
	2.To identify the basics of professional Writing
	3. To acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
Pre-Requisites	NONE
Teaching Pedagogy	Regular classroom lectures with use of the interaction, experiential, activity oriented.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction to Communication** 1. **Process and Factors of Communication** 1.1. History & Significance of Communication 1.2. Communication loop 1.3. Factors Responsible (Sender, Receiver, Channel, Code, Feedback etc.) 2. **Verbal and Non-verbal communication** 2.1. Verbal Communication 2.3. Non-Verbal Communication (Body language, Paralanguage) 3. **Barriers to Communication** 3.1. Barriers and Filters 3.2. Types of Barriers (Physical, Psychological, , Cultural Barrier etc. 3.3. Tips to Overcome Barriers ***Experiential Learning: Non-verbal communication***	**06 hours 3+2+1 +1(EL) =7 hour**

Module-2	**Professional Writing** 1. **Letters &E-mail writing** 1.1 Block format, 1.2 E-Mail address 1.3 Subject Line 1.4 Organizing the body 1.5 E-Mail etiquette **2. Notice, Memo, Circular** 2.1 Format of the Notice 2.2 Writing strategy **3. Using social media for communication** 3.1 Writing blogs 3.2 What's app messages **4. *Experiential Learning* :*Using social media for communication***	2+3+3 **08 Hours**
Module-3	**Literature Appreciation** Name of the Lessons: 1.A.P.J Abdul Kalam from Wings of Fire, A.P.J Abdul Kalam with Arun Tiwari 2. "Spoken English & Broken English" by Bernard Shaw 3. Life Doesn't Frighten Me Poem by Maya Angelou 4. On Superstitions by A.G.Gardiner	**8 Hours**

Reference Books:

R1. An Introduction to Professional English and Soft Skills - Das et al.- Foundation Books
R2. Understanding Human Communication - by Ronald B. Adler
R3. Technical Communication, Fourth Edition-Meenakshi Raman & Sangeeta Sharma
R4. The Definitive Book of Body Language by Allan Pease
R5. Silent messages by Albert Mehrabian
R6. Advanced English Grammar by Martin Hewing
R7. English Grammar in use- Raymond Murphy

Online Resources:

www.britishcouncil.in
http://nptel.ac.in
http://eltai.in

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

CO1	Learn the fundamentals of communication
CO2	Understand the basic professional writing
CO3	Evaluate Literary convention

Type	Code		L-T-P	Credits	Marks
MC	BTMC-T-MC-101	**Information Technology and Information Systems (IT & IS)**	2-0-0	0	100

Objectives	To expose to the fundamental usage of Computer.
Pre-Requisites	Basic knowledge of English in Secondary Education
Teaching Scheme	Regular Lab with use of ICT. Each session is planned to be interactive with focus on real life activities.

Detailed Syllabus

Module	Course to be Covered	Hours
Module 1	Introduction Windows OS, OS Commands and operations, Introduction to MS Office **MS-Word:** Create; open, save, print command of file. Home tab: Edit texts, Format text, Paragraph setting and apply styles. Insert tab: Cover page, blank page, page break, table, picture, clip art, shape, chart, hyperlink, header and footer, Textbox, word art, equation and symbols.	5 Hours
Module 2	MS-WORD: Mailing tab : Mail merge, Page Layout tab: margin, orientation, size, columns, watermark, page color, page border, Review tab: spelling and grammar checking, Thesaurus. **MS-EXCEL:** Create workbook, Home tab, Insert tab: Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art.	5 Hours
Module 3	MS-EXCEL: Page Layout tab : Margin, Orientation, Paper size, Print area, Background Formulas tab : Auto sum(sum, average, count numbers, max, min), Insert Function(if, sum if, count if, average if, max if, min if) MS-EXCEL: Data Tab: Sort and filter, Text to column, Remove Duplicate, Data Validation, Group.	5 Hours
Module 4	**MS-POWER POINT:** Create file, Home tab, Insert new slide, change layout Insert tab : Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art, Header Footer, movie, sound. **Internet Technology** : MS-Outlook, E-mail **Social media Application:** Twitter, Linked-In, Facebook, Instagram	5 Hours
Module 5	**GRAMMERLY:** Creating and uploading documents, Editing text Using GrammarlyGO, Formatting text , Checking your document for plagiarism. **ChatGPT :** Introduction,ChatGPT in general life, Uses and Applications of ChatGPT: Blog Topics and Keyword Research, Assist in Generating Copy for a Website	4 Hours

	Proofreading and Editing,Creating WordPress Plugins, Writing and Debugging Code	
TOTAL		**24 Hours**

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

CO1	To give basic fundamental concept about computer system.
CO2	To get familiar with MS Windows OS.
CO3	To get hands on expertise in MS Word.
CO4	Able to solve mathematical problems systematically using MS excel.
CO5	Able to design professional presentation using MS PowerPoint.
CO6	Able to manage the information in computer system using internet technology.

EXPERIMENTS:

Experiment No.	**Course to be Covered**	**Hours**
Experiment-1	Introduction Windows OS, OS Commands and operations, Introduction to MS Office	2 Hours
Experiment-2	MS-Word: Create; open, save, print command of file. Home tab: Edit texts, Format text, Paragraph setting and apply styles.	2 Hours
Experiment-3	MS-WORD: Insert tab: Cover page, blank page, page break, table, picture, clip art, shape, chart, hyperlink, header and footer, Textbox, word art, equation and symbols.	2 Hours
Experiment-4	MS-WORD: Mailing tab : Mail merge, Page Layout tab: margin, orientation, size, columns, watermark, page color, page border, Review tab: spelling and grammar checking, Thesaurus.	2 Hours
Experiment-5	MS-EXCEL: Create workbook, Home tab, Insert tab Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art.	2 Hours
Experiment-6	MS-EXCEL: Page Layout tab : Margin, Orientation, Paper size, Print area, Background	2 Hours
Experiment-7	MS-EXCEL: Formulas tab : Auto sum(sum, average, count numbers, max, min), Insert Function(if, sum if, count if, average if, max if, min if)	2 Hours
Experiment-8	MS-EXCEL: Data Tab: Sort and filter, Text to column, Remove Duplicate, Data Validation, Group.	2 Hours
Experiment-9	MS-POWER POINT: Create file, Home tab, Insert new slide, change layout Insert tab : Table, picture, Clip art, Shapes, Charts, Hyperlink, Textbox, Word Art, Header Footer, movie, sound.	2 Hours
Experiment-10	Internet Technology : MS-Outlook, E-mail Social media Application: Twitter, Linked-In, Facebook, Instagram	2 Hours

Experiment-11	GRAMMERLY: Creating and uploading documents, Editing text Using GrammarlyGO, Formatting text , Checking your document for plagiarism.	2 Hours
Experiment-12	ChatGPT : Introduction, ChatGPT in general life, Uses and Applications of ChatGPT, Blog Topics and Keyword Research, Assist in Generating Copy for a Website Proofreading and Editing,Creating WordPress Plugins, Writing and Debugging Code	2 Hours
TOTAL		**24 Hours**

Reading Material (s)

1. IT & IS Lab Manual, Department of CSE, GIFT, Bhubaneswar
2. Microsoft Office 2010 Introductory BY Gary B. Shelly, Misty E. Vermaat.

Type	Code		L-T-P	Credits	Marks
MC	BTMC-T-MC-102	**Constitution of India**	2-0-0	0	100

Objectives	The objective of this subject is to provide understanding of the basic concepts of Indian Constitution and various organs created by the constitution including their functions. The course acquaints students with the constitutional design of state structures and institutions, and their actual working overt ime.
Pre-Requisites	Basic knowledge of Indian history, overall idea on India's political system.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required and each session is planned to be interactive.

Evaluation Scheme

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Indian Constitution, Historical perspective of the constitution of India. Preamble of Indian constitution, Salient features of Indian constitution, Fundamental rights, Fundamental Duties and its legal status, Directive principles of state policy -its importance and Implementation.	**8 Hours**
Module-2	Federal structure and distribution of legislative and financial powers between the Union and the States, The Union legislature - The Parliament - The Lok Sabha and the Rajya Sabha, Composition, powers and functions, Union executive, President of India (with powers and functions), Vice-President, The Council of Ministers and the Prime Minister - Powers and functions.	**6 Hours**
Module-3	State Government, The State Legislature - composition, powers and functions, State executive, Governor (with powers and functions).	**5 Hours**
Module-4	Amendment of the Constitutional Powers and Procedure, Emergency Provisions: National Emergency, President Rule, Financial Emergency. Scheme of the Fundamental Right to Equality Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and Personal Liberty under Article 21. Local Self Government - Constitutional Scheme in India.	**5 Hours**

Module-5	The Indian Judicial System - the Supreme Court and the High Court's composition, jurisdiction and functions, Judicial review, Judicial activism, independence of Judiciary in India.	**4 Hours**
Total		**28 Hours**

Text Books:

T1. D. D. Basu, Introduction of Constitution of India, 22nd Edition, LexisNexis, 2015.

T2. K. Subas, An Introduction to India's Constitution and Constitutional Law, 5th Edition, National Book Trust India, 2011.

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

CO1	Provide basic information about Indian constitution.
CO2	Analyze the legalities and related issues of drafting, adoption and enforcement of the Indian Constitution as a fundamental law of the nation and the provisions and privileges of Indian Citizenship.
CO3	Understand and judiciously use the fundamental rights and privileges envisaged in the constitution.
CO4	Analyze the major dimensions of Indian Political System and to contribute in protecting and preserving the sovereignty and integrity of India.
CO5	Know the successful functioning of democracy in India
CO6	Understand their obligations, responsibilities, privileges & rights, duties and the role that they have to play in deciding the Administrative Machinery of the country.

Type	Code	Mathematics - II	L-T-P	Credits	Marks
BS	BTBS-T-BS-211		4-1-0	3	150

Objectives	The objective of this course is to familiarize the students with the knowledge and concepts of numerical methods to solve the system of linear equations & ordinary differential equations, interpolation, and applications of vector integral calculus.
Pre-Requisites	A sound knowledge of linear algebra, basic calculus, and matrix algebra.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module	Topics	Hours
Module-1	Root finding of algebraic and transcendental equations: Bisection method, Secant and Regula-falsi methods, Newton's method, Fixed point iteration method, Rate of convergence. Experiential learning- Finding the root of transcendental equations using MATLAB.	**11 Hours**
Module-2	Interpolation: Lagrange interpolation, Newton's divided difference interpolation, Newton's forward and backward interpolation. Numerical differentiation and Integration: Newton-Cotes quadrature formula, Trapezoidal rule, Simpson's rule, 2-point and 3-point Gauss Legendre rule. Euler method, Modified Euler method. Experiential learning- Evaluation of numerical integrals and solution of initial value problems.	**14 Hours**
Module-3	Beta and Gamma functions, Vector Integral Calculus: Line Integrals, Independence of Path, Double Integrals, Green's theorem with applications.	**9 Hours**
Module-4	Series Completion, Coding-Decoding, Data Sufficiency, Basic concepts on Probability and statistics.	**11 Hours**
	Total	**45 Hours**

Text Books:

T1. E. Kreyszig, Advanced Engineering Mathematics, Wiley India.

T2. B. V. Raman, Higher Engineering Mathematics, Mc Graw Hill Education Pvt. Ltd.

T3. R. S. Aggarwal, A Modern Approach to Verbal & Non-verbal reasoning, S. Chand publication.

Reference Books:

R1. S. Pal and S. C. Bhunia, Engineering Mathematics, Oxford University Press.

R2. P. V. O'Neil, Advanced Engineering Mathematics, Cengage Learning.

R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.

R4. B. P. Acharya, R. N. Das, A Course on Numerical Analysis, Kalyani Publishers

R5. R. Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists & Engineers, Wiley

Online Resources:

1. https://nptel.ac.in/courses/127106019
2. https://nptel.ac.in/courses/111102111
3. https://nptel.ac.in/courses/111105122
4. https://nptel.ac.in/courses/111105121
5. https://nptel.ac.in/courses/111105134

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

CO1	Apply the numerical methods to find the approximate solutions of algebraic and transcendental equations.
CO2	Evaluate the real time problems using MATLAB.
CO3	Solve the numerical solution of differential equations and use of various techniques for evaluating the integrals.
CO4	Calculate line integrals in two dimensions for differential forms and also calculate double integrals in Cartesian and polar coordinates over the domains.
CO5	Know the basic concepts of verbal, non-verbal reasoning and logical ability for better employability.
CO6	Understand the basic concepts of mathematical theory of probability.

Type	Code	Programming Using Data Structure	L-T-P	Credits	Marks
ES	BTES-T-ES-203		4-1-0	3	150

Objectives	Exploring basic data structures concept used in Industries
Pre-Requisites	Knowledge of Mathematics in Secondary Education and basic Programming concept.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction: Basic Terminologies: Algorithm Analysis: Mathematical Background, Model, Analyze, Running Time Calculations, Asymptotic Notations, classification of data structure. Basic data st ructure:1d-Array and 2d-Array Data Structure Operations: insertion, deletion, traversal Sparse matrix, address calculation of Array , ADT(Abstract Data type),DMA(Dynamic memory allocation),pointer, Self-referential structure. A comparison between DMA and SMA. De-allocation Strategy, Buddy System, Compaction.	**10 Hours**
Module-2	**Stacks and Queues**: ADT Stack array representation and its operations: Algorithms Applications of Stacks: Expression Conversion and evaluation of expression and corresponding algorithms, **Experiential Learning:** application of stack Types of Queue: Simple Queue, Circular Queue, Priority Queue ADT queue,; Array representation and Operations on each types of Queues: Algorithms and their analysis, application of queue.(Simulation, CPU Scheduling in Multiprogramming Environment, Round Robin Algorithm).. Priority Queues.	**8 Hours**
Module-3	**Linked Lists**: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	**8 Hours**
Module-4	**Sorting and searching:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, **Experiential Learning:** Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Radix sort; Performance and Comparison among all the methods, Searching: **Experiential Learning:** Linear search, Binary search and time complexity and space complexity analysis, Hashing: Hash function and technics of	**8 Hours**

Module-5	**Trees**: Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree, Tree Traversing, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis, Red black trees: definition and operation, Applications of all trees. **Graph**: Basic Terminologies and Representations (Adjacency matrix and linked list representation), Graph search and traversal algorithms and complexity analysis, classification of graph Minimum spanning tree (Kruskal and prims algorithm), Shortest path algorithm: Dijkstra's algorithm, topological sorting.	**6 Hours**
Total		**40 Hours**

Text Books:

T1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press

T2. Data Structures with C (Schaum's Outline Series), Seymour Lipschutz, TMH

Reference Books:

R1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning

R2. Data Structures And Algorithms A.V.Aho, J. E. Hopcroft, and J. D. Ullman, ǁ, Pearson Education, First Edition Reprint 2003R3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication.

R3. How to solve it by Computer, 2nd Impression by R. G. Dormey, Pearson Education

R4. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education

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

CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation.
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues.
CO3	Understand the implementation and application of linear data structure
CO4	Understanding of tree traversal techniques and their application
CO5	Understand the graph traversal and its application In real life.
CO6	Understand Algorithm for different sorting, searching techniques and their running complexity, and basic concept of hash function

Type	Code	English for Engineers-II	L-T-P	Credits	Marks
HS	BTBS-T-HS-211		2-0-0	1	100

Objectives	To understand the nuances professional Communication
	To prepare students for real world interaction
	To enhance the soft skill competency of learners
Pre-Requisites	To have a common understanding of concepts of communication.
Teaching Pedagogy	Real world-based teaching learning pedagogy.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Professional Communication 1. Patterns of Communication 1.1 Formal &Semi Formal: Vertical, Horizontal, Diagonal communication 1.2 Informal: Grapevine 1.3 External and Internal Communication ***2. Experiential Learning: Patterns of Communication***	**3+1(EL) 4Hours**
Module-2	**Employment Communication & Soft skill** 1.1. Cover Letter and Resume' Building, Types of Resumes: Traditional & Electronics 1.2. Presenting to the audience :4ps 1.3. Cross Cultural Competency 1.4. Group Discussion, Types of GD, Do's and don'ts 1.5. Interview, Types of Interviews, How to Prepare for an Interview ***Experiential Learning: Cross Cultural Competency***	**2+2+2+2+2 =10+4(EL) Hours**

Module-3	Literature Appreciations 1. Steve Jobs by Isaacson Walter 2. An Interview with Microsoft CEO: Satya Nadella by Sudipta Sengupta, TNN, March 10,2023 ***Experiential Learning: Book Review***	**6 Hours+ 1(EL)=7Hr**

Reference Books:

R1. Corporate Soft Skills-Sarvesh Gulati- Rupa Publications
R2. Bridging the Soft Skills Gap- Brucetulgan
R3. Excellence in Business Communication - John V. Thill, Courtland Bovee
R4. Simply Said: Communicating Better at Work and Beyond by Jay Sullivan
R5. Steve Jobs by Isaacson Walter

Online Resources:

https://communicationmgmt.usc.edu
https://nptel.ac.in
www.britishcouncil.org
https://eltai.ac.in
https://in.coursera.

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

CO1	Understand the various forms and Channels of communication in a corporate world
CO2	Develop skills to meet the placement challenges
CO3	Implement different forms of writing for professional needs
CO4	Acquiring skills set to sustain the professional careers.

Type	Code	Elements of Engineering Physics Laboratory	L-T-P	Credits	Marks
BS	BTBS-P-BS-102		0-0-2	1	100

Objectives	The laboratory should help students to understand the role of direct observation in physics and to distinguish between inferences based on theory and on the outcomes of experiments.
Pre-Requisites	Knowledge of Physics in Secondary Education
TeachingPedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Determination of acceleration due to gravity (g) by bar pendulum.	**2 Hours**
Experiment-2	Determination of rigidity modulus by using Barton's apparatus.	**2 Hours**
Experiment-3	Determination of surface tension of a given liquid by capillary rise method.	**2 Hours**
Experiment-4	Determination of wavelength of an unknown monochromatic source of light using Newton's ring apparatus.	**2 Hours**
Experiment-5	Plotting of V~I characteristics of PN junction diode.	**2 Hours**
Experiment-6	Determination of Young's modulus by using Searle's apparatus	**2 Hours**
Experiment-7	Plotting of input and output characteristics of BJT (Bipolar junction	**2 Hours**
Experiment-8	Determination of grating element of a plane diffraction grating.	**2 Hours**
Experiment-9	Determination of co-efficient of thermal conductivity of a bad conductor by Lee's disc method.	**2 Hours**
Experiment-10	Verification of laws of vibrations in a stretched string using Sono metre.	**2 Hours**
	BEYOND SYLLABUS	**2 Hours**
Experiment-11	To find out the resistance of unknown wire by using Meter bridge.	**2 Hours**
Total		**22 Hours**

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

CO1	Understand the laws to various process and real system.
CO2	Study basics of semiconductor & devices and their applications in different areas.
CO3	Distinguish the importance of different properties of material.

CO4	Design new instruments with practical knowledge.
CO5	Analyze, interpret and summarize the experimental results and compare with theoretical
CO6	Troubleshoot effectively in laboratory settings.

Indicative Projects

1. To make a periscope to understand the laws of reflection.
2. To make an electromagnet.
3. To make a line following Robot.
4. To make a portable Mobile charger.
5. To make a Rain Alarm /soil moisture Detector.
6. To make an Automatic street light.
7. To make a proto type solar panel.
8. To make a gas leakage detector.
9. To make a temperature sensor.
10. To build an earthquake alarm.
11. To make a coin cell by using super capacitor material.

Type	Code		L-T-P	Credits	Marks
BS	BTBS-P-BS-103	**Applied Chemistry Laboratory**	0-0-2	1	100

Objectives	The laboratory will help the students on the volumetric analysis, calculations based on mass- volume relation etc. The students will get knowledge on the synthesis of different medicines, preparation of soap & detergents etc. The students will get knowledge on the operation of different equipment's.
Pre-Requisites	Knowledge of chemistry in Secondary Education.
TeachingPedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Standardization of KMnO4 by using sodium oxalate. Determination of $Fe2^{+}$ ion in a double salt.	**2 Hours**
Experiment-2	Preparation of Aspirin	**2 Hours**
Experiment-3	To determine Dissolved oxygen in a given sample of water	**2 Hours**
Experiment-4	Determine the amount of Sodium Hydroxide and Sodium carbonate in the given solution using Standard acid	**2 Hours**
Experiment-5	Estimation of Ca^{2+} ion in a sample of limestone	**2 Hours**
Experiment-6	Determination of partition coefficient of I_2 between benzene and water.	**2 Hours**
Experiment-7	Determination of flash and fire point of an oil by Pensky Martine's apparatus.	**2 Hours**
Experiment-8	Determination of viscosity of lubricating oil by Redwood viscometer.	**2 Hours**
Experiment-9	Determination of available chlorine in a sample of bleaching powder	**2 Hours**
Experiment-10	Determination of TH value of water by EDTA method.	**2 Hours**
	BEYOND SYLLABUS	
Experiment-11	Preparation of soap and detergent.	**2 Hours**
	Total	**22 Hours**

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

CO1	Acquire knowledge on the basic volumetric analysis.
CO2	Classify various fuels based on combustion parameters and understand the working Principle based on their properties.
CO3	Know the importance of analytical techniques, instrumentation and applications
CO4	Impart knowledge on of water quality parameters and treatment of water.
CO5	Acquire Knowledge about synthesis and preparation of drugs, soap etc.

Indicative Projects

1. Preparation Detergent Powder From Paddy Husk
2. Quantity of Presence of Casein in Different Samples of Milk
3. Preparation of Organic Dye.
4. Preparation of Toilet Soaps
5. Presence of Oxalate Ions in Guava Fruit and Different Stages of Ripening.
6. Sterilization of Water Using Bleaching Powder.
7. Preparation of ash brick.
8. Preparation of Gelatin.
9. Preparation of Paracetamol.
10. Preparation of Ink.
11. Effect of Potassium Bisulphate as a Food Preservative.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-P-ES-101	**Basic Electrical Engineering Laboratory**	0-0-2	1	100

Objectives	To train the students in conducting load tests on electrical circuit and equipment's To gain practical experience in characterizing electrical machinery.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Pedagogy	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Study of Different Electrical measuring Instruments and other electrical equipment	**2 Hours**
Experiment-2	Verification of thevenin's theorem using DC circuits.	**2 Hours**
Experiment-3	Verification of Superposition theorem theorem using DC circuits.	**2 Hours**
Experiment-4	Verification of Maximum power transfer theorem using DC circuits.	**2 Hours**
Experiment-5	Measurement of Voltage, current, power and power factor calculation in series R-L-C circuit.	**2 Hours**
Experiment-6	Verification and calculation of Resonance frequency in series R-L-C circuit.	**2 Hours**
Experiment-7	Connection and Demonstration of Domestic Wiring System	**2 Hours**
Experiment-8	Connection and Running of DC Motors, DC generators, 3- phase Induction motors and 1- phase Transformers	**2 Hours**
Experiment-9	Power and phase measurements in three phase system by two wattmeter method	**2 Hours**
Experiment-10	OC and SC test on single phase transformer	**2 Hours**
	BEYOND SYLLABUS	
Experiment-11	Verification of Ohm's Law	**2 Hours**
Experiment-12	Verification of B-H curve	**2 Hours**
Total		**24 Hours**

Online Resources:

1. http://vlabs.iitkgp.ernet.in/be/
2. http://sl-coep.vlabs.ac.in/

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

CO1	Identify different Electrical Instruments and measure different parameters.
CO2	Study connection and demonstration of DC generators, motors and wiring systems.
CO3	Study design and connection of Different Lamps
CO4	Identify active and passive electronic components and handle measuring instruments like
CO5	Design different circuits using diode, BJT and opamps.
CO6	Design and analyze logic gates

Indicative Projects

SL. NO.	NAME OF THE PROJECT
1	Mobile Charger
2	Extension Board
3	Multiple USB Port
4	Brushless DC Motor Driver
5	Small Transformers Upto 7V.
6	Small Model Of Bio-Gas Plant
7	Temperature Control 12v DC Fan
8	Making Of Led Bulbs.

Type	Code		L-T-P	Credits	Marks
ES	BTBS-P-ES-102	**Basic Electronics Engineering Laboratory**	0-0-2	1	100

Objectives	To train the students in conducting load tests on electrical machines To gain practical experience in characterizing electronic devices To train the students to use CRO and DSO for measurements
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Scheme	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Study of Different Electrical measuring Instruments and other electrical equipment	2 Hours
Experiment-2	Measurement of Voltage, current, power and power factor calculation in series R-L-C circuit.	2 Hours
Experiment-3	Connection and Running of DC Motors, DC generators, 3- phase Induction motors and 1- phase Transformers.	2 Hours
Experiment-4	Connection and Demonstration of Domestic Wiring System.	2 Hours
Experiment-5	Model Study & Connection of Different Lamps (Mercury Vapor Lamp, Tungsten, LED Bulbs, Fluorescents, CFL)	2 Hours
Experiment-6	A:- Identification of electronic components, devices and Basic Sensors, B:- Study and use of CRO/ DSO, Function generator to view and measure different wave forms.	2 Hours
Experiment-7	Design of Simple Diode Circuit and Study of V-I characteristics of semiconductor Diode & calculation of DC and AC Resistance	2 Hours
Experiment-8	Design of Half – wave rectifier and full wave rectifier circuits, and calculation of efficiency	2 Hours
Experiment-9	Design of inverting and non- inverting amplifiers using Op-Amp to view and measure waveforms	2 Hours
Experiment-10	Study and truth table verification of logic gates.	2 Hours
	BEYOND SYLLABUS	
Experiment-11	Design of simple BJT Bias circuit to draw VI characteristics (input & output) of a NPN transistor (in CE configuration)	2 Hours
Experiment-12	Verification of Ohm's Law	2 Hours
	Total	24 Hours

Online Resources:

1. http://vlabs.iitkgp.ernet.in/be/
2. http://sl-coep.vlabs.ac.in/
3.

CO1	To identify different Electrical Instruments and measure different parameters.
CO2	To study connection and demonstration of DC generators, motors and wiring systems.
CO3	To study design and connection of Different Lamps
CO4	To identify active and passive electronic components and handle measuring instruments like CRO and DSO.
CO5	To design different circuits using diode, BJT and opamps.
CO6	To design and analyze logic gates

Indicative Projects

SL. NO.	NAME OF THE PROJECT
1	Night light using LDR.
2	Automatic Fan ON/OFF using Temperature Sensor.
3	Moisture Controller using Moisture Sensor.
4	Fire Alarm using Temperature Sensor.
5	Light ON /OFF using Piezo Sensor.
6	Clap sound Operated using Sound Sensor.
7	Rain Detector
8	Power supply Circuit
9	Touch less Doorbell
10	Motion Detector using Ultrasonic Sensor

Type	Code		L-T-P	Credits	Marks
ES	BTES-P-ES-103	**Basic Programming Skills Laboratory**	0-0-4	2	100

Objectives	To expose to the field of Problem Solving and Programing
Pre-Requisites	Knowledge of Mathematics in Secondary Education
Teaching Pedagogy	Regular Lab with use of ICT. Each session is planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Familiarity with basic UNIX/LINUX command, vi editor. Sample C Program.	**2 Hours**
Experiment-2	Programs on arithmetic expressions, operators, and precedence.	**2 Hours**
Experiment-3	Programs on Conditional Branching.	**2 Hours**
Experiment-4	Programs on Loops.	**2 Hours**
Experiment-5	Programs on single dimensional array.	**2 Hours**
Experiment-6	Programs on two-dimensional array.	**2 Hours**
Experiment-7	Programs on Functions.	**2 Hours**
Experiment-8	Programs on Recursive Functions.	**2 Hours**
Experiment-9	Programs on Pointers.	**2 Hours**
Experiment-10	Programs on Dynamic Memory Allocation.	**2 Hours**
Experiment-11	Programs on Structure.	**2 Hours**
Experiment-12	Programs on Union.	**2 Hours**
Experiment-13	Programs on File Handling.	**2 Hours**
Experiment-14	Implementation of Linear search.	**2 Hours**
Experiment-15	Implementation of sorting algorithm: Bubble Sort	**2 Hours**
Experiment-16	Arduino Programming – Introduction to Sensors, Introduction to Microcontrollers.	**2 Hours**
Experiment-17	Programing, Serial Communication	**2 Hours**
Experiment-18	Arduino based Project	**2 Hours**

	Total	**38 Hours**

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

CO1	Remember basic understanding of computer and basic concepts of running programs.
CO2	Understand the concepts of decision making and looping for solving problems.
CO3	Learn to concise and precise on implementing pseudo code using functions
CO4	Illustrate the usages of array, function and pointer in programming.
CO5	Select the user define data type structure, union and enum for problem solving.
CO6	Develop projects using different file handling functions.

Projects using C Programing

1) Unit Converter
2) Customer Billing System in a Shopping Mall
3) Banking Management System
4) University Grading System
5) Bus Ticket Reservation System
6) Home Automation System
7) Digital Wall Clock
8) Book Support Automation
9) Lab Management System
10) Nursery Management System

Arduino based Project

1) Obstacle detection using Arduino
2) Controlling 4 LEDs to make different patterns
3) Voice Activation System
4) Use Humidity Sensor using Arduino
5) Arduino Based Color Detector
6) Touch Dimmer Switch Circuit Using Arduino
7) Wireless Door Bell
8) Arduino Traffic Light Controller
9) Frequency Counter Using Arduino
10) Arduino 4-Digit 7-Segment LED Display
11) Arduino based Digital Thermometer
12) Arduino Light Sensor
13) Portable Ultrasonic Range Meter
14) Security Alarm System Using Arduino
15) Arduino Alarm Clock
16) Interfacing LCD with Arduino

Type	Code	Basic Mechanical Engineering Laboratory	L-T-P	Credits	Marks
ES	BTBS-P-ES-104		0-0-2	1	100

Objectives	To train the students in conducting experiment and get acquainted with different measuring devices, gain practical experience on Refrigerator, IC engine, Hydraulic Machines, Power transmission system and Gear trains. Experience application of Bernoulli's theorem and Meta center.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education
Teaching Scheme	Regular practical classes with use of virtual lab as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Validation of Bourdon tube pressure guage with U-tube Manometer	**2 Hours**
Experiment-2	Verification of Flow measuring apparatus (Venturi meter/ orifice meter/ rota meter)	**2Hours**
Experiment-3	Determination of COP of Domestic refrigerator	**2 Hours**
Experiment-4	Draw valve timing diagram of two stroke & four stroke petrol and diesel engine	**2Hours**
Experiment-5	Verification of Bernoulli's Theorem	**2 Hours**
Experiment-6	Determination of Meta centre	**2 Hours**
Experiment-7	Determination of mechanical efficiency of Pelton & Francis Turbine	**2 Hours**
Experiment-8	Comparison of efficiency of Centrifugal pump apparatus, Reciprocating	**2 Hours**
Experiment-9	Determination of speed ratio of Simple ,Compound & reverted Gear train	**2 Hours**
Experiment-10	Demonstration of power transmission system	**2 Hours**
Total		**20 Hours**

At the end of the semester students will able to

CO1	Experience different pressure and flow measuring instruments
CO2	Experience working principle of refrigerator and IC engines
CO3	Get knowledge about application of Bernoulli's Theorem and Meta centre
CO4	Get knowledge of different types of hydraulic machines
CO5	Experience different types gear trains and able to find out mechanical advantage and gear
CO6	Get idea of power transmission system

Indicative Projects (Mechanical)

1. Component Preparation using 3D Printing
2. Specimen preparation technique for Metallurgical study.
3. To prepare a ship model for verification of Archimedes principle.
4. Model of Steam power plant.
5. Overhead gantry crane of 3-axis movements.
6. Leading & Trailing brake arrangement in Drum Brake
7. High speed reduction in gear drive by using worm & worm wheel.
8. Specimen preparation and its test in UTM.
9. Wind Turbine Model.
10. Preparation hexagonal headed Bolt (Facing & Turning)
11. Specimen preparation and its test in Fatigue testing machine.
12. Water turbine Project Model
13. Preparation hexagonal headed Bolt (Step Turning & Thread Cutting)
14. Preparation of Components/names in CNC Wood Router
15. Bio-fuel preparation and Study.
16. Compound gear train using by using Spur gear.
17. Fast and loose pulley arrangement using Belt drive
18. Development of cone clutch for power transmission.
19. Conversion of Reciprocating to rotary motion using Crank & Connecting rod.

Type	Code	Basic Civil Engineering Laboratory	L-T-P	Credits	Marks
ES	BTES-P-ES-102		0-0-2	1	100

Objectives	To train the students in conducting different test on engineering materials. To gain practical experience in characterizing soil and handling hydraulic machines. To train the students to use different measuring instruments.
Pre-Requisites	Knowledge of Physics and Chemistry in Secondary Education
Teaching Pedagogy	Regular practical classes with use of virtual labas and when required, sessions are planned to be interactive with focus on problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Water absorption test of brick.	**2 Hours**
Experiment-2	Compressive strength of Brick.	**2 Hours**
Experiment-3	Determination of Specific gravity of soil	**2 Hours**
Experiment-4	Sieve Analysis of Soil.	**2 Hours**
Experiment-5	Study of different instruments used in survey.	**2 Hours**
Experiment-6	Compressive strength of Concrete.	**2 Hours**
Experiment-7	Study of Different types of pipe fittings	**2 Hours**
Experiment-8	Measurement of bearing of a line.	**2 Hours**
Experiment-9	Study of Solenoid Valve	**2 Hours**
Experiment-10	Study of Sensors.	**2 Hours**
	BEYOND SYLLABUS	**2 Hours**
Total		**20 Hours**

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

CO-1	Identify the different properties of building materials
CO-2	Understanding the different modes of transportation
CO-3	Study of engineering properties of soil
CO-4	Analyze of water supply system by sensors and solenoids
CO-5	Evaluating different types of pumps
CO-6	Explore the uses of different instruments used in civil engineering work

Indicative Projects (Civil)

1. Intelligent transportation system. – prototype
2. Glass fiber reinforced concrete.
3. pH test of drinking water in gift campus.
4. Preparation of building blocks.
5. Identification of different parts of dam – prototype
6. Pavement layer identification – prototype
7. Concept of suspension bridge –prototype
8. Construction of English bond in cement mortar.
9. Study of properties for the locally available Soil .
10. Testing of compressive strength of the local stone in Khordha.
11. Admixtures used in RMC – visit to plant
12. Preparation of fly ash brick.
13. Seasoning of timber.
14. Types of timber used in construction.
15. Tensile strength test of steel in construction
16. Identification of components of a building – prototype
17. Various field test of cement.

Type	Code		L-T-P	Credits	Marks
ES	BTES-P-ES-104	**Engineering Graphics with Auto-CAD Laboratory**	0-0-3	1.5	100

Objectives	To develop the ability to produce simple Engineering Drawings based on current practice and to increase the skill to read the Product, Manufacturing, and Construction drawings used in Industries.
Pre-Requisites	Basic Knowledge on simple Geometry And shape of Simple Solid's
Teaching Pedagogy	Regular practical classes with use of virtual labs and when required sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	To prepare a sheet on Lines and their uses.	**3Hours**
Experiment-2	To prepare a sheet on Lettering, dimensioning.	**3Hours**
Experiment-3	To prepare a sheet on Projection of point and lines.	**3Hours**
Experiment-4	To prepare a sheet on Projection of planes & Solids .	**3Hours**
Experiment-5	To draw Lines/Planes/ solids using Auto CAD.	**3Hours**
Experiment-6	To prepare a sheet on section of Solid and development of surfaces.	**3Hours**
Experiment-7	To draw the Ortho graphics projections of solids and sectioning using Auto CAD.	**3Hours**
Experiment-8	To Prepare a sheet on isometric projections.	**3Hours**
Experiment-9	To draw isometric view of solids using Auto CAD.	**3Hours**
Experiment-10	To prepare a sheet on Building Drawing.	**3Hours**
	BEYOND SYLLABUS	
Experiment-11	To draw Ortho Graphic views of standard Isometric Solids.	**3 Hours**
Total		**33 Hours**

After completing this course the students should be able to:

CO1	Understand the visual aspect of engineering drawing, scales and Orthographic Projections
CO2	Acquire knowledge on projection of points, lines and plane surfaces and solids.
CO3	Understand the basics of Auto CAD, Commands and Toolbar.
CO4	Apply modern engineering tools like Auto CAD and creating working drawings on sectioning of Solids and development of surfaces.
CO5	Able to draw Isometric view of standard Solids using Auto CAD.
CO6	Apply the knowledge to create building drawings

Indicative Projects

1. 2D Drawing from Simple 3D Object With given Specification.
2. Component Diagram of Simple Physical Sheet Metal Part, Worm Gear, Hub-Shaft.
3. Nut-Bolt-Washer assembly, simple Plastic component
4. 2D Drawing from Simple 3D Object of Agriculture component..
5. Drawing of simple Storage Bin/Silo.
6. Drip Layout Sketch.
7. Drawing of Rooftop Garden Planning
8. Drawing of switch, Led monitor.
9. Drawing of Plug socket, Diode & Transistor.
10. House Wiring Diagram For a room having 1-Lamp, 1-Fan and 1-Plug socket.
11. 2D drawing of Disc Antenna, Common electronics components
12. 2D drawing of Electronics components symbol diagram with circuit.
13. Drawing Of All Simple Graphic Element & Monitor stand..
14. Drawing monitor
15. 2D drawing of Keyboard and CPU.

Type	Code		L-T-P	Credits	Marks
ES	BTES-P-ES-105	**Workshop Practice –I Laboratory**	0-0-3	1.5	100

Objectives	The laboratory should help students to understand the role of different tools & its function for different operation by manually or by machine to get different job as required
Pre-Requisites	Knowledge of different geometry in Secondary Education
Teaching Pedagogy	Regular practical classes with use of virtual labs and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	To make a Square from the given mild steel piece	**3 Hours**
Experiment-2	To make a V-Square fit from the given mild steel piece	**3 Hours**
Experiment-3	To prepare a Lap Joint with Electric Arc welding.	**3 Hours**
Experiment-4	To prepare a butt Joint with V-Groove Electric Arc welding. Method.	**3 Hours**
Experiment-5	To prepare butt/T-joint by gas welding	**3 Hours**
Experiment-6	To prepare joint by Soldering /Brazing.	**3 Hours**
Experiment-7	To prepare a job on given specimen in machine shop. (turning, threading ,knurling,milling,drilling and shaping	**3 Hours**
Experiment-8	To make the Mortise &tenon –joint wood	**3 Hours**
Experiment-9	To make the dovetail joint on wood.	**3 Hours**
Experiment-10	To make tray from sheet metal	**3 Hours**
	BEYOND SYLLABUS	**3 Hours**
Experiment-11	To make funnel in sheet metal	**3 Hours**
Total		**33 Hours**

After completing this course the students should be able to:

CO1	Learn the safety measures, different tools and equipment used in mechanical workshop.
CO2	Understand the concept of metal joining process and its engineering application.
CO4	Improve understanding of various fitting jobs & its application.
CO4	Understand the various machining process in Machine shop.
CO5	Learn Hands on practices & Job making in Carpentry Shop.

CO6	Discuss the application of Sheet metal Operation.

Indicative Projects

1. To make Gas cylinder stand by M.S. flat
2. To make Refrigerator stand by wooden plank
3. To make Wooden table
4. To make Partial Parshall flume (Venturi)
5. To make Drop spill way(wooden)
6. To make Indigenous plough(wooden)
7. To make Tray drier(sheet metal)
8. To make T.W. switch board for three switches and one socket
9. To make Sheet metal box to conduit wiring
10. To make Simple open water turbine
11. To make Soldering rod
12. To make Monitor stand
13. To make Phone or Tab stand
14. To make Support IOT kit implementation in ceiling fan hanging support rod
15. To make multimeter board.

Type	Code	English for Engineers –I (Laboratory)	L-T-P	Credits	Marks
BS	BTHS-P-HS-111		0-0-2	1	100

Objectives	To develop the skills in communication.
	To evaluate the LSRW skills with efficiency.
	To distinguish the sub skills of reading comprehension for better understanding.
	To implement the process of effective writing.
Pre-Requisites	To have basic knowledge on LSRW skills
Teaching Pedagogy	Regular sessions are planned to be interactive with examples to be acquainted with different types of communication context. .

Detailed Syllabus

SL N0	NAME OF THE ACTIVITY	HOURS
ACTIVITY 1	Ice Breaking & Self- Introduction	2 Hours
ACTIVITY 2	The Raman Effect, Reading: Task1- Task 3, Vocabulary: Task4- Task 5 (Prefixes and Suffixes)	2 Hours
ACTIVITY 3	The Raman Effect, Grammar: Identifying Common Errors in Writing. (Task 6 to Task 15)	2 Hours
ACTIVITY 4	The Raman Effect, Writing: (Task 16 to Task 29) Paragraph Writing	2 Hours
ACTIVITY 5	Ancient Architecture, Vocabulary: Task1 to Task 3 (Synonym and Antonym), Grammar: Subject-verb Agreement. (Task 4 to Task 7)	2 Hours
ACTIVITY 6	Ancient Architecture ,Writing: Task11 to Task 18 (Formal Letter an)	2 Hours
ACTIVITY 7	Sounds of English	2 Hours
ACTIVITY 8	Sounds of English	2 Hours
ACTIVITY 9	Role Play	2 Hours
ACTIVITY 10	Debate	2 Hours

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

CO1	Develop the understanding of language
CO2	Discuss the rules of language for effective communication
CO3	Analyze the pronunciation of English language
CO4	Recognize different forms of formal writing

Type	Code	Programming Using Data Structure Laboratory	L-T-P	Credits	Marks
ES	BTES-P-ES-203		0-0-4	2	100

Objectives	Exploring basic data structures such as stacks and queues
Pre-Requisites	Knowledge of Mathematics in Secondary Education and basic Programming concept.
TeachingScheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Experiment-1	Write a C program to perform matrix addition and multiplication using array	**2Hours**
Experiment-2	Write a C program to create a stack using an array and perform (i) push operation (ii) pop operation	**2Hours**
Experiment-3	Write a C program to create a queue and perform (i) Push (ii) Pop (iii) Traversal	**2Hours**
Experiment-4	Write a C program that converts infix expression into postfix expression Using Stack operations.	**2Hours**
Experiment-5	Write a C program that evaluates postfix expression using Stack operations	**2Hours**
Experiment-6	Write a C program that uses functions to perform the following operations on Single linked list: (i) Creation (ii) Insertion (iii) Deletion (iv) Traversal	**2Hours**
Experiment-7	Write a C program that uses functions to perform the following operations on Double linked list: (i) Creation (ii) Insertion (iii) Deletion (iv) Traversal in both ways	**2Hours**
Experiment-8	Write a C program that uses functions to perform the following operations on Binary Search Tree: (i) Creation	**2Hours**

	(ii) Insertion (iii) Deletion	
Experiment-9	Write a C programs that use both recursive and non-recursive functions to perform the Linear search operation for a Key value in a given list of integers Write C program that use both recursive and non-recursive functions to perform the Binary search operation for a Key value in a given list of integers	**2Hours**
Experiment-10	Write a C program that implement Bubble Sort method to sort a given list of integers in descending order	**2Hours**
Experiment-11	Write a C program that implements Quick Sort method to sort a given list of integers in ascending order	**2Hours**
Experiment-12	Write a C program that implements Insertion method to sort a given list of integers in ascending order	**2Hours**
Experiment-13	Write a C program that implements merge sort method to sort a given list of integers in ascending order	**2Hours**
Experiment-14	Write a C program that implements heap sort method to sort a given list of integers in ascending order	**2Hours**
Experiment-15	Write a C program that implements selection sort method to sort a given list of integers in ascending order	**2Hours**

CO1	To insert and delete elements from appropriate position in an array.
CO2	To search an element and print the total time of occurrence in the array..
CO3	To represent a Sparse Matrix.
CO4	To delete all occurrence of an element in an array.
CO5	Array implementation of Stack.
CO6	Array implementation of Linear Queue.

Indicative Projects

Arduino based Project

1) Contacts directory System
2) Texting editor relied on Stacks
3) BST which follows the Memorization procedure
4) Search system (in Library)
5) Snakes and Ladders Game
6) Sorted_double_sentinel_list
7) Phone directory application using doubly-linked lists
8) Spatial indexing with quadtrees
9) Numerical representations with random access lists
10) Stack-based text editor
11) Personal Diary Management System

12) Tic-Tac-Toe Game
13) Tank Game
14) Travel Agency Management System
15) Pharmacy Management System

Type	Code	English for Engineers –II (Laboratory)	L-T-P	Credits	Mark
BS	BTBS-P-HS-211		0-0-2	1	100

Objectives	
	To equip the students with different forms of professional writing
	To acquaint them with interpersonal etiquette to face corporate challenges
	To understand the nuances of GD-PI
Pre-Requisites	Basic knowledge of applications of communication
Teaching Pedagogy	Application oriented, task based, need based, teaching Pedagogy

Detailed Syllabus

Activity No	Activity Name	Hours
Activity: 1	Blue Jeans Sub Skills of Reading: Task14- Task 15	2 Hours
Activity:2	How a Chinese Billionaire Built Her Fortune Vocabulary: Task1 to Task 3 (Technical and Computer related Terms)	2 Hours
Activity:3	How a Chinese Billionaire Built Her Fortune Writing: Task12 to Task 14(Report)	2 Hours
Activity:4	Sop practice,	2 Hours
Activity:5	Proposal Writing	2Hours
Activity:6	Oral Presentation 1	2 Hours
Activity:7	Oral Presentation 2	2 Hours
Activity:8	Group Discussion1	2 Hours
Activity:9	Group Discussion 2	2 Hours
Activity:10	Mock Interview	2 Hours
Total		**20 Hours**

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

CO1	Develop knowledge in interpersonal communication.
CO2	Develop skills for corporate readiness.
CO3	Implement the different forms of professional correspondence.
CO4	Apply English grammar and essentials of language skills as per present requirement.

Part 2
2nd Year B. Tech.
(Computer Engineering)

Contents

Second Year

Curriculum Structure

B. Tech (CE) (3rd Semester & 4th Semester)

Type	Code	Mathematics for Computer Science	L-T-P	Credits	Marks
BS	BTBS-T-BS-301		4-1-0	3	200

Objectives	• The objective of this course is to familiarize the students with the knowledge and concepts of Laplace transformation. • To familiarize the students with the knowledge and concepts of Fourier series • To be familiar with the concept of discrete mathematics.
Pre-Requisites	A basic knowledge of relation, function, derivative, and integration.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module	Topics	Hours
Module-1	Laplace transformation, Inverse Laplace transformation, Unit step function, Dirac's delta function, Convolution, applications in solving differential equations, and Integral Equations	**8 Hours**
Module-2	Fourier series, Fourier expansion of functions of any period, Even and odd functions, Half range Expansion.	**6 Hours**
Module-3	Fourier Integral, Fourier transform, Fourier sine and cosine transforms, Basic propreties.	**6 Hours**
Module-4	Relation and Functions: Properties of binary relations, Reflexive, Symmetric, Transitive, Anti-Symmetric, Partial Ordering and Total Ordering, Equivalence relations, Closure of relations, Warshall's algorithm.	**9 Hours**
Module-5	Lattices and Properties, Boolean Algebra: Basic Properties, CNF and DNF, K- map.	**7 Hours**
Module-6	Numeric and Generating Functions: Discrete Numeric Functions, Generating Functions, Recurrence relations: Linear recurrence relations with constant coefficients, Solution of recurrence relations (Homogeneous and Non-homogeneous) by the method of generating functions.	**9 Hours**
Total		**45**

Text Books:	
1	Advanced Engineering Mathematics, E. Kreyszig, Wiley India, ISBN 13: 9780470458365.
2	"Fundamentals of Database System", R.Elmasri, S.B Navathe, Adision Wesley Publishing, ISBN-13: 978-0-136-08620-8 1.
3	Discrete Mathematics and its Applications, Kenneth H. Rosen, Tata McGraw Hill, 5th Edition, 2003, ISBN-13. 978-0070681880.
4	Elements of Discrete Mathematics: A computer Oriented Approach, C. L. Liu, D. P. Mohapatra, McGraw Hill Education (India) Private Limited, 4th Edition, 2013, ISBN-13. 978-1259006395.
Reference Books:	
1	Engineering Mathematics, S. Pal and S. C. Bhunia, Oxford University Press, ISBN-13*:* 978-1680921229.
2	Advanced Engineering Mathematics, P. V. O'Neil, Cengage Learning, ISBN-13. 978-0470458365.
3	Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, ISBN-13. 978-8174091956.
4	Graph Theory with applications to Engineering & Computer Science, N. Deo, Prentice Hall of India,2006, ISBN-13: 978-8120301450.
5	Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and R.Manohar, Tata Mc-Graw Hill, 2001, ISBN-13. 978-0074631133.
6	Discrete Mathematics, S. Lipschutz, Tata McGraw Hill, 2005, ISBN-13. 978-1930190863.
7	Discrete Mathematics for Computer Scientists & Mathematics, Joe L. Mott, A. Kandel, and T. P. Baker, Prentice Hall of India, 2nd Edition, 2006, ISBN-13. 978-9332550490.

Online Resources:

1. https://nptel.ac.in/courses/111104075/
2. https://nptel.ac.in/courses/111104078/
3. https://nptel.ac.in/courses/111104092/
4. https://nptel.ac.in/courses/122104017/
5. https://nptel.ac.in/courses/122104017
6. https://nptel.ac.in/courses/111102111/
7. https://nptel.ac.in/courses/111105035/287
8. https://nptel.ac.in/courses/111105035/28

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

CO1	Understand Laplace transforms and their applications.
CO2	Apply Fourier series and Fourier Transform of a given function appropriately
CO3	Understand the special functions.
CO4	Know about relation and function with their applications.
CO5	Understand generating functions, recurrence relations & their applications in computer science.
CO6	Understand discrete numeric functions and generating functions and their applications.

Type	Code	Database Management Systems	L-T-P	Credits	Marks
CS	BTCS-T-PC-302		3-0-0	3	200

Objectives	• Understand the relational database design principles. • Familiar with the basic issues of transaction processing and concurrency control. • Familiar with database storage structures and access techniques.
Pre-Requisites	Fundamental computer knowledge that includes concepts of computer architecture, storage and hardware. Knowledge of MS Excel or other Tabular formats.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module	Topics	Hours
Module-1	Introduction to DBMS: Database applications, purpose, accessing and modifying databases, need for transactions; Types of DBMS: Data models, DB languages; Architecture: Users and administrators, 3-schema architecture of DBMS, data independence, EF Codd Rule.	**06 Hours**
Module-2	ER Model: Basic concepts, Design issues, keys, ER diagram, Entity types, Attributes, Relationships, Relationship types, Weak entity sets, Extended ER features; Relational model: Structure of relational model, Relational algebra, Extended relational algebra Operations.	**07 Hours**
Module - 3	Relational database design: Features of good design, Properties of Relational Decomposition, Functional Dependency; Anomalies in designing DB: Normalization using FDs, Various Normal forms-1NF, 2NF, 3NF, BCNF, Concepts of 4NF, 5NF.	**08 Hours**
Module - 4	SQL and Integrity Constraints: Concepts of DDL, DML, DCL; SQL operations: Set operations, Aggregate functions, Constraints, View, Nested sub-queries,.	**06 Hours**
Module - 5	PL/SQL, cursor, trigger. Internals of RDBMS: Query optimization, various optimization algorithms.	**06 Hours**
Module - 6	Transaction processing: Transaction processing and Error recovery - concepts of transaction processing, ACID properties, concurrency control, locking based protocols for CC, error recovery and logging, undo, redo, undo-redo logging andrecovery methods.	**07 Hours**
	Total	**40 Hours**

Text Books:	
1	"Database system concepts", Korth, Silverschatz, Abraham, Tata McGraw Hill Publication, ISBN-13. 978-0078022159.
Reference Books:	
1	"Database management systems, A Practical Approach", Er.Rajiv chopra, S.Chand Publishing, ISBN-13 978-0071168984
2	"Fundamentals of Database System", R.Elmasri, S.B Navathe, Adision Wesley Publishing, ISBN-13. 978-0133970777.
3	"Database management systems", Ramkrishna, Tata McGraw Hill Publication, ISBN-13. 978-0072465631.

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

CO1	Understand data models to design a database.
CO2	Illustrate the conceptual design for large enterprises.
CO3	Formulate SQL queries and integrity constraints over relations.
CO4	Apply normalization on database for eliminating redundancy.
CO5	Summarize transaction properties, concurrency control and recovery techniques.
CO6	Explain various data storage and security mechanisms.

Type	Code	Digital Logic Design	L-T-P	Credits	Marks
OE	BTEC-T-OE-303		3-0-0	3	200

Objectives	1-To study presentation of various signals in time and spectrum domains, and stability & causality of LSI systems, 2-To study processing of digital signal using Z-transform, discrete Fourier transform. 3-To design IIR & FIR filters..
Pre-Requisites	Basic Electronics
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Number System:** Introduction to various number systems and their Conversion. Arithmetic Operation using 1's and 2`s Compliments, Signed Binary and Floating-Point Number Representation. Introduction to Binary codes and their applications. **Boolean Algebra and Logic Gates:** Boolean algebra and identities, Complete Logic set, logic gates and truth tables. Universal logic gates, realization using universal logic gates.	**6 Hours**
Module-2	Algebraic Reduction, Canonical Logic Forms, Extracting Canonical Forms, NAND and NOR Logic Implementations, K-Map, QM Method. Combinational Logic Design: Analysis, Design: Specifying the Problem, Concept of Digital Components	**8 Hours**
Module-3	Binary Adders, Subtraction and Multiplication, An Equality Detector and comparator, Line Decoder, encoders, Multiplexers and De-multiplexers. Hazards and Hazard free circuits. Sequential Logic Design: Flip flop and Timing circuit: set-reset laches, D-flip flop , R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop	**8 Hours**
Module-4	Serial in/Serial out shift register, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register.	**6 Hours**
Module-5	Analysis, Design: Registers & Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Johnson counter, ring counter, sequence generator	**6 Hours**
Module-6	**Semiconductor Memory**: Static and Dynamic memory. RAM and ROMs, Programmable Logic Array, Programmable Array Logic.	**6 Hours**
TOTAL		**40 Hours**

Text Books:	
1	Digital Design, 3rd Edition, Moris M. Mano, Pearson Education, ISBN 13: 9788183335805.
2	A First Course in Digital System Design: An Integrated Approach, India Edition, John P,. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc, ISBN-13: 978-0534934125.
Reference Books:	
1	Fundamentals of digital circuits, 8th edition, A. Anand Kumar, PHI, ISBN-13: 978- 8120352681
2	Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi, ISBN-13: 978-1639043569.
3	Digital Electronics, G. K. Kharate, Oxford University Press, ISBN-13 978-9350141991
4	Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education, ISBN-13 978-0750645829

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

CO1	Understand the basic components and laws of digital circuits.
CO2	Learn the representation and simplification of digital circuits
CO3	Analyze and design various Combinational circuits.
CO4	Analyze and design various Sequential circuits.
CO5	Apply the HDL for digital circuits.
CO6	Validate combinational logic circuits using programmable logic devices.

Type	Code	Organizational Behavior	L-T-P	Credits	Marks
HS	BTBS-T-HS-304		3-0-0	3	200

Objectives	• To understand the concepts and theories useful for diagnosing human behavior in modern-day organizations. • To examine different aspects of organizational structure such as formation of organizational systems, structure, and processes. To develop an understanding of these theories and of related ideas and concepts and critically evaluate them. • To develop skills to deeply analyze human behavior and apply the learning's to organizational context. Understanding the group dynamics and Leadership in the Organization.
Pre-Requisites	To stimulate specific goals and achieve optimal performance from workers, it is useful to explore ways of stimulating fruitful behaviors from workers by studying organizational behavior.
Teaching Pedagogy	Regular classroom lectures with use of ICT as needed. Each session is planned to be interactive with focus on real-world problem solving through case lets.

Detailed Syllabus

Module	Topics	Hours
Module 1	Introduction- Nature, Scope, Purpose, Function, Elements of OB. Evolution of OB - Classical, Scientific, Administrative, Human Relation Movement, Bureaucracy, System Theory. Contribution to the field of Management by different Disciplines, Model of OB, Application of OB. **Case Let.**	**10 hours**
Module 2	Perception & Learning- Understanding of perception and its basic elements, perceptual selection, social perception, self –perception and identity, perceptual biases. Learning in organization and classical and operant conditioning. Personality- Meaning of Personality, Personality Development, Determinants of personality, Personality Theories, Self-esteem & Self-awareness, Application of personality in the organizational level. **Case Let.**	**10 hours**
Module 3	Motivation- Concept of motivation, motivation and behavior, Misbehavior, Types of motives, Management Intervention. Theories of motivation, Need theory, Hygiene theory, Theory X and Theory Y, ERG Theory, Vroom's Expectancy Theory, Equity Theory, Elements of sound motivational system, Money as a motivator, Motivation in Indian organization. **Case Let.**	**6 hours**
Module 4	Attitude- Definition, key elements and related concepts (value, opinion, belief and ideology), characteristics of attitudes, attitude formation and measurement, changing attitude, attitude at workplace (job satisfaction, work attitude and organizational commitment). Emotions at workplace: Definition, types, related concepts (mood, temperament), Managing emotions at workplace, emotional intelligence , meaning of stress , Work Stressors, Stress at work place, General Adaption syndrome, emotional labor, Balancing work and Life. **Case Let.**	**4 hours**

Module 5	Leadership- Meaning, Leader Vs. Manager, leadership theories, Leadership styles, Leadership in Indian Organization. Group Dynamics- Define Groups & teams, Types of Group, Group Behavior, Group Formation, Group Decisions, and Techniques to improve group decision, merits and de-merits of group decision. **Case Let.**	**6 hours**
Module 6	Organizational Change- Meaning and Nature of organizational change, Factors of organizational change, Resistance to change, Managing resistance to change, Overcoming resistance to change. Organizational culture- Impact of culture on individuals, Cultural dimensions, Types of culture.	**4 hours**
Total		**40 hours**

Text Book	
1	A Textbook of Organizational Behavior, by S.S. Khanka, S Chand, ISBN-13 978-8121943017
Reference Books	
1	Organizational Behavior, K. Aswathappa, Sadhana Dash, Himalaya Publishing House, ISBN-13. 978-0201154610.
2	Organizational Behavior. Arun Kumar and N. Meenaskshi .Vikas Publishing House, 2009, ISBN-13. 978-0201154610.
3	Managing Organizational Behavior, Moorhead & Griffin. CENGAGE Learning, 2014, ISBN-13: 978-0136124436.
4	Human Behavior at Work. Keith Davies, 2002, ISBN-13. 978-0750645829.
5	Understanding Organizational Behavior. Pareek, U. Oxford University Press, (2012), ISBN-13: 978-0198070733.
6	Organizational Behaviour, M. N. Mishra, Vikas Publishing House, ISBN-13. 978-0201154610.
7	Organizational behavior , N. Kumar & R. Mittal, Anmol Publication, ISBN-13. 978-0201154610.
8	A Textbook of Organizational Behavior , C. B. Gupta, S Chand, ISBN-13 978-8121943017
9	Organizational Behaviour, Robbins/Vohra, Pearson, ISBN-13. 978-0201154610.

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

CO1	Discuss the development of the field of organizational behavior and explain the micro andmacro approaches.
CO2	Analyses and compare different models used to explain individual behavior related tomotivation and rewards.
CO3	Explain group dynamics and demonstrate skills required for working in groups.
CO4	Identify the various leadership styles and the role of leader in a decision-making process.
CO5	Explain organizational culture and describe its dimensions and to examine various Organizational designs.
CO6	Discuss the implementation of organizational change.

Type	Code	Object Oriented Programming using JAVA	L-T-P	Credits	Marks
PC	BTCS-T-PC-305		3-0-0	3	200

Objectives	• To learn why Java is useful for the design of desktop and web applications. • To learn how to implement object-oriented designs with Java. To identify Java language components and how they work together in applications. • To design and program stand-alone Java applications.
Pre-Requisites	Knowledge of programming in 'C'
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned Pedagogy to be interactive with focus on real- life problem- solving activities.

Detailed Syllabus

Module	Topics	Hours
Module-1	**Object oriented paradigm:** structured versus object-oriented development, Introduction to Object oriented programming concepts: Objects, classes, encapsulation and abstraction, inheritance, polymorphism, dynamic binding, message passing. Executing the program, Architecture of JVM. Understanding First Program and a step forward, Java Tokens, Data types, Operators, Typecasting, Control Structures and Arrays, Conditional Statements, Jumping Statements.	**08 Hours**
Module-2	**Java I/O:** Taking Input from keyboard, Command Line Arguments, Using Scanner Class, Using Buffered Reader class. **Object and Classes:** class and object, functions and data members, static members. **Constructors** - default constructor, parameterized constructor.	**06 Hours**
Module-3	**Inheritance:** Derived and base classes, public, private, and protected derivations, constructors in derived classes, Constructor call in Inheritance, super keyword, this keyword. **Data Abstraction:** Basics of Data Abstraction, Understanding Abstract classes, Understanding Interfaces, Multiple InheritanceUsing Interfaces.	**06 Hours**
Module-4	**Polymorphism:** Types of polymorphism, Significance of Polymorphism in Java, Method Overloading, Constructor Overloading, Method Overriding, Dynamic Method Dispatching. **String Manipulations:** Introduction to different classes, String class, String Buffer, String Builder, String Tokenizer. **Wrapper Classes:** Introduction to wrapper classes, Different predefined wrapper classes. Conversion of types from one type (Object) to another type (Primitive) and Vice versa, Concept of Auto boxing and unboxing.	**06 Hours**

Module-5	**Packages:** Introduction to Packages, Java API Packages, User-Defined Packages, Accessing Packages. **Multithreading:** Thread in Java, Thread naming and Priorities, Thread execution prevention methods. (yield (), join (), sleep ()), Concept of Synchronization, Inter Thread Communication, Basics of Deadlock, Demon Thread.	**06 Hours**
Module-6	**Exception handling:** Error and Exception Handling, Types of exceptions, Hierarchy of Exception classes, Default exception handling in Java, User defined/Customized Exception Handling (try, catch, finally, throw, throws). **Abstract Window Toolkit (AWT):** Description of Components and Containers, Component/Container hierarchy, Understanding different components/Container classes and their constructors, swing.	**08 Hours**
	Total	**40 Hours**

Text Book	
1	JAVA Complete Reference (9th Edition) , Herbal Scheldt, ISBN-13: 978-1260440232.
Reference Books	
1	CORE JAVA For Beginners. (Rashmi Kanta Das), Vikas Publication, ISBN-13: 978-8125950837
2	Programming in Java. Second Edition. OXFORD HIGHER EDUCATION. (SACHIN MALHOTRA / SAURAV CHOUDHARY), ISBN-13:978-8120352872
3	Effective Java 3rd Edition ,Joshua Bloch (Author), ISBN-13: 978-0134685991
4	Java For Dummies 6th Edition , Barry A. Burd (Author), ISBN-13: 978-1119680451

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

CO1	Understand the Object-oriented programming concepts and every term of the program.
CO2	Test and execute the programmers by Object and Class and implement inheritance property.
CO3	Implement polymorphism and string manipulation.
CO4	Determine data abstraction and wrapper classes to achieve code reusability.
CO5	Analyze the multithreading and package implementation.
CO6	Understand the hierarchy of file stream classes and the concept of exception handling.

Type	Code		L-T-P	Credits	Marks
SC	BTSC-T-SC-306	**ABILITY ENHANCEMENT TRAINING-B**	1-0-0	1	200

Objectives	• The course aims at imparting basic principles of thought process, reasoning and inferencing. • Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature. Holistic lifestyle of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. • The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem - solving activities.

Detailed Syllabus

Module #	Topic	Hours
Module 1	**Introduction to traditional knowledge-** Define Traditional Knowledge- Nature and Characteristics- Scope and Importance-kinds of Traditional Knowledge- The historical impact of social change on Traditional Knowledge Systems- Value of Traditional knowledge in global economy.	**05 Hours**
Module 2	**Basic structure of Indian Knowledge System Veda** - Rigveda, Samaveda, Yajurveda, and Atharvaveda	**03 Hours**
Module 3	**Upaveda - -** (Ayurved, Dhanurveda, Gandharva Veda & Sthapatyaveda)	**03 Hours**
Module 4	**Vedanga- (** Shiksha,, Kalpa, Nirukta, Vyakarana,Jyotisha,Chanda)**&** **Upanga -** (Dharmashastra, Meemamsa, purana & Tarka Shastra)	**03 Hours**
Module 5	**Modern Science and Indian Knowledge System**	**03Hours**
Module 6	**Yoga and Holistic Health**	**03 Hours**
	Total	**20 Hours**

Text Book	
1	Quantitative Aptitude ,R S Aggarwal, ISBN-13: 978-0199488780.
2	Quantitative Aptitude for CAT ,Arun Sharma, ISBN-13: 978-9355321626.
Reference Books	
1	Fast Track Objective Arithmetic , Arihant Publications, ISBN-13: 978-9312149836.

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

CO1	Identify Basic Organization of Computers.
CO2	Identify the addressing modes used in macro instructions.
CO3	Apply algorithms for arithmetic operations and implementation for ALU design.
CO4	Develop micro code for typical instructions in symbolic form.
CO5	Develop the pipeline and its performance.
CO6	Identify Characteristics of Memory System.

Type	Code		L-T-P	Credits	Marks
MC	BTMC-T-MC-302	**ENVIRONMENTAL ENGINEERING**	3-1-0	3	150

Objectives	1. To Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge. 2. To Make use of their knowledge to interpret the data by experimental analysis to provide valid conclusions 3. To Identify, formulate, review research literature and analyze complex Environmental Engineering problems using fundamentals of mathematics, sciences and engineering. 4. To Develop solutions for Environmental Engineering problems and design system components and processes to meet the specified needs with appropriate consideration for the public health and safety. 5. To Apply the knowledge of mathematics, Science and Engineering fundamentals for solution of problems of Environmental Engineering.
Pre-Requisites	Knowledge of Science and technology in Secondary level.
Teaching Pedagogy	Regular class room lectures with use of ICT and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module	Topics	Hours
Module -1	**Ecology & Ecosystem: Components**. Ecological concepts and natural Resources: Ecological perspective and value of environment, Environmental auditing, Biotic components, Levels of organizations in environment Ecosystem Process: Energy, Food chain, Environmental gradients, Tolerance levels of environmental factor. Components of Earth System: Lithosphere, Cryosphere, Atmosphere, Hydrosphere, Biosphere and Outer space.	**10 Hours**
Module -2	**Environmental Resources**: Natural Resources covering Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternative). Hydrological cycle, water balance,	**6 Hours**
Module -3	**Environmental Pollution**: Definition, Causes, effects and control measures of: Water pollution, Air pollution, Noise pollution, Soil pollution, Marine pollution, Thermal pollution.	**10Hours**

Module -4	**Environmental Issues**: Climate change, Global warming, Acid rain, Ozone layer depletion, Water conservation, rain water harvesting, artificial recharge, watershed management, carbon trading, carbon foot print National Ambient Air quality Standards, Noise standards, Vehicle emission standards	**7 Hours**
Module -5	Drinking water standard (IS 10500), Water Quality Criteria Water treatment: Water sources and their quality, Lay out of a water treatment plant and working of each unit/ principles of each process i.e. Screening, Aeration, Sedimentation, coagulation, flocculation, Filtration, Disinfection.	**5 Hours**
Module -6	Miscellaneous treatment: Removal of color, tastes and odour control, removal of iron and manganese, fluoridation and de-fluoridation in drinking water. Advanced water treatment: Ion exchange, electro-dialysis, RO, desalination Working principles of ready-made water filter/purification system commercially available.	**6 Hours**
	Total	**44 Hours**

Text Books:	
1	Environmental Engineering, G. Kiely, TMH, 2007

Reference Books:	
1	Environmental Engineering, H.S. Peavy, D.R.Rowe and G. Tchobanoglous, McGraw Hill, 1985.
2	Introduction to Environmental Engineering, M. L. Davis and D. A Cornwell, McGraw Hill International,2005.

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

CO1	Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge.
CO2	Make use of their knowledge to interpret the data by experimental analysis to provide valid conclusions
CO3	Identify, formulate, review research literature and analyze complex Environmental Engineering problems using fundamentals of mathematics, sciences and engineering.
CO4	Develop solutions for Environmental Engineering problems and design system components and processes to meet the specified needs with appropriate consideration for the public health and safety.
CO5	Apply the knowledge of mathematics, Science and Engineering fundamentals for solution of problems of Environmental Engineering.
CO6	Assess societal, health, safety and legal issues by applying Environmental Engineering knowledge.

Type	Code	Database Management Systems Lab	L-T-P	Credits	Marks
PC	BTCS-P-PC-302		0-0-3	1	200

Objectives	To expose to the field of Database.
Pre-Requisites	Fundamental computer knowledge that includes concepts of computer architecture, storage and hardware. Knowledge of MS Excel or other Tabular formats.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Execute DDL Commands	2 Hours
2	Execute DML Commands	2 Hours
3	Execute DCL and TCL Commands.	2 Hours
4	Create table using constraints.	2 Hours
5	Create views, partitions and locks for a particular DB	2 Hours
6	Execute joins (Inner and Outer) for 2 tables.	2 Hours
7	Write PL/SQL procedure for an application using cursors.	2 Hours
8	Write a PL/SQL block for transaction operations of a typical application using triggers.	2 Hours
9	Write a PL/SQL block for transaction operations of a typical application using package.	2 Hours
10	Write a PL/SQL procedure for an application using exception handling.	2 Hours

Text Books:	
1	Database Management Systems Lab Manual, Department of CSE, GIFT, Bhubaneswar, ISBN-13: 979-8846287921

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

CO1	Illustrate ER model and identify the roles and privileges of various users in a database.
CO2	Apply common SQL statements (including DDL, DML and DCL) to perform different operations.
CO3	Construct SQL Queries for various operations on database.
CO4	Interpret Embedded and Nested Queries.
CO5	Implement control statements in PL/SQL.
CO6	Apply triggers and assertions to stop malicious operations on tables.

Type	Code	Digital Logic Design Lab	L-T-P	Credits	Marks
OE	BTEC-P-OE-303		0-0-2	1	100

Objectives	• The objective is to analyze the designing process of combinational and sequential circuits, express arithmetic logic and shift micro-operations. • To identify the addressing modes used in macro instructions • To apply algorithms for arithmetic operations and implementation for ALU design.
Pre-Requisites	Knowledge of Digital Electronics Circuits
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Investigate logic behavior of NOT, AND, OR, NAND, NOR, EX-OR, EXNOR gates.	2 Hours
2	Gate-level minimization: Two level and multi-level implementation of Boolean functions.	2 Hours
3	Implementation using universal gates.	2 Hours
4	Combinational Circuits: design, assemble and test: adders and subtractors, code converters	2 Hours
5	Design of multiplexers and de-multiplexer	2 Hours
6	Flip-Flop: assemble, test and investigate operation of SR, D & J-K flip-flops.	2 Hours
7	Shift Registers: Design and investigate the operation of all types of shift registers with Parallel load.	2 Hours
8	Study and design of Asynchronous Counters.	2 Hours
9	Study and design of synchronous Counters.	2 Hours
10	Clock-pulse generator: design, implement and test	2 Hours
11	Design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bitproduct.	2 Hours
12	VHDL simulation and implementation of adder.	2 Hours

Text Books:	
1	Digital Electronics Circuit Lab Manual, Department of ECE, GIFT, Bhubaneswar, ISBN-13. 978-1648282270.

Type	Code	Object Oriented Programming with JAVA Lab	L-T-P	Credits	Marks
PC	BTCS-P-PC-305		0-0-3	1	100

Objectives	To expose to the field of Problem Solving and Programing
Pre-Requisites	Knowledge of Mathematics in Secondary Education
Teaching Pedagogy	Regular Lab with use of ICT. Each session is planned to be interactive with focus on real- life problem- solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Introduction, compiling and executing java program	**2 Hours**
2	Programs related to different data types, variables, constants, operators	**2 Hours**
3	Conditional statements, control structures (while, do-while, for) Jumping statements	**2 Hours**
4	Array and multidimensional array	**2 Hours**
5	Object, class and Constructors	**2 Hours**
6	Inheritance, Interfaces and multiple inheritance	**2 Hours**
7	Polymorphism (method overloading and method overriding)	**2 Hours**
8	String Manipulations, Wrapper Class, Package.	**2 Hours**
9	Java threads (yield (), join (), sleep ()), Concept of Synchronization, Inter Thread Communication)	**2 Hours**
10	Exception handling, AWT, Event Handling.	**2 Hours**

Text Books:
Object Oriented Programming with JAVA Lab Manual, Department of CSE, GIFT, Bhubaneswar

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

CO1	Using object-oriented features, such as abstraction, inheritance, polymorphism etc. for writing effective programs.
CO2	Understand and compile code under java programming environment. (Using different data types, control structure and arrays)
CO3	Apply polymorphism and string concept to solve a problem in real world.
CO4	Develop own package and apply thread synchronization using multi-threading concept.
CO5	Recommend different error handling methods to handle the exception and make the java program more efficient.
CO6	Create API to design web based as well as stand-alone applications. (Using AWT and Swing)

Type	Code	SEMINAR-I	L-T-P	Credits	Marks
PS	BTCS-P-PS-307		0-0-3	1	100

Objectives	• To encourage the students to study advanced engineering developments • To prepare and present technical reports. • To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
Pre-Requisites	Knowledge of Speaking with globally accepted language and subject analysis.
Teaching Pedagogy	Regular seminar presentation and evaluation with record keeping.

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

CO1	Outline the topics on modern technology; prepare implementation of the same as the presentation.
CO2	Understanding the technologies used by extracting the new things to be implemented by reviewing the journals/research papers.
CO3	Sketch the application of the technology for the use of the mankind.
CO4	Analyse and correlate the new technology with the subject of interest for further study.
CO5	Evaluate, plan and reframe the technology with the communication skills for a better explanation
CO6	Modify and design the concept into the realistic world.

Type	Code	Evaluation of Summer Internship-1	L-T-P	Credits	Marks
SC	BTCS-P-SC-308		0-0-3	1	100

Objectives	• To encourage the students to study advanced engineering developments • To prepare and present technical reports. • To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
Pre-Requisites	Knowledge of Speaking with globally accepted language, subject analysis, practical implementation.
Teaching Pedagogy	Regular contact with interns and evaluation with record keeping.

METHOD OF EVALUATION:

1. During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes.
2. In a session of one period per week, 5 students are expected to present the seminar.
3. Each student is expected to present at least twice during the semester and the student is evaluated based on that.
4. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
5. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
6. Evaluation is 100% internal.

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

CO1	State the functioning of organization and observe changes for self-improvement.
CO2	Explain how the internship placement site fits into a broader career field.
CO3	Apply appropriate workplace behaviors in a professional setting.
CO4	Solve real life challenges in the workplace by analyzing work environment and conditions, and
CO5	Evaluate the internship experience in terms of personal, educational and career needs.
CO6	Develop ideas for suitable startups to become successful entrepreneur.

Fourth Semester

Type	Code	Design and Analysis of Algorithms	L-T-P	Credits	Marks
PC	BTCS-T-PC-401		3-0-1	3	150

Objectives	• To Introduce various designing techniques and methods for algorithms • Performance analysis of Algorithms using asymptotic and empirical approaches • • Demonstrate a familiarity with major algorithms and data structures.
Pre-Requisites	Knowledge of Mathematics in Secondary Education, Data Structure and Exposer to any programming Language.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Notion of Algorithm**: Growth of functions, Recurrences: The Master method, The Substitution method, The Iteration method, Asymptotic Notations and Basic Efficiency Classes (Use of Big O, θ, etc.) in analysis of algorithms, Mathematical Analysis of Non-Recursive and Recursive Algorithms.	**6 Hours**
Module-2	**Divide and conquer approach:** Disjoint Set and their Implementation, Divide and Conquer Paradigm of problem solving, Complexity analysis and understanding of Merge Sort, Quick Sort. Heaps and Heap Sort.	**7 Hours**
Module-3	**Dynamic Programming Paradigm**: Floyd-War shall Algorithm, Optimal Binary Search trees, Matrix Chain Multiplication Problem, Longest Common Subsequence Problem, 0/1 Knapsack Problem, Maximum Network Flow Problem.	**6 Hours**
Module-4	**Graph Algorithms and Greedy Techniques:** DFS, BFS, Topological Sorting, Activity Selection Problem, Huffman Trees, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's and Bellman Ford Algorithm, , Knapsack problem.	**7 Hours**
Module-5	**String Matching Algorithms**: Naive string-matching algorithm, The Rabin- Karp Algorithm, string matching with Finite Automata, Knuth Morris Pratt string matching algorithm. **Backtracking**: n-Queen's problem, Hamiltonian Circuit problem, Subset-Sum problem, State Space Search Tree.	**7Hours**
Module-6	**Branch and Bound**: Travelling Salesman Problem and its State Space Search Tree. **Introduction to Computability**: Polynomial-time verification, NP Completeness and Reducibility, NP-Complete problems (without proof). **Approximation Algorithms:** Vertex Cover Problem.	**7 Hours**
	Total	**40 Hours**

Text Book	
1	"Introduction to Algorithms", Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Third Edition, PHI Learning Private Limited, 2012, ISBN-13. 978-0132316811.
Reference Books	
1	"Data Structures and Algorithms" Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Pearson Education, Reprint 2006, Data Structures and Algorithms, ISBN-13: 978-0201000238.
2	"The Art of Computer Programming" Donald E. Knuth, Volumes 1& 3 Pearson Education, 2009, ISBN-13: 978-0201896831.
4	"The Design and Analysis of Computer Algorithms" A.V. Aho, J. E. Hopcroft and J.D.Ullman, Pearson Education, ISBN-13. 978-0201000290.
5	"Algorithms, Data Structures, and Problem Solving", by Illustrated Edition Mark Allen Weiss, Addison-Wesley Publishing Company, ISBN-13 978-0805316667

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

CO1	Define the various algorithm analysis methods and the asymptotic time complexities of various statements with its correctness.
CO2	Explain important algorithmic design paradigms (divide-and-conquer, greedy method, dynamic-programming and Backtracking) and apply when an algorithmic design situation calls for it.
CO3	Demonstrate the major graph algorithms and Employ graphs to model engineering problems, when appropriate.
CO4	Apply different data structures for problem solving and pick an appropriate data structure for a design situation.
CO5	Compare the classes P, NP, and NP Complete and be able to prove that a certain problem is NP-Complete.
CO6	Familiarizing students with specific algorithms for a number of important computational problems design and development.

Type	Code	Computer Organization and Architecture	L-T-P	Credits	Marks
PC	BTCS-T-PC-402		3-0-1	3	150

Objectives	• To analyze the designing process of combinational and sequential circuits • To express arithmetic logic and shift micro-operations, identify the addressing modes used in macro instructions • To apply algorithms for arithmetic operations and implementation for ALU design.
Pre-Requisites	Knowledge of Digital Electronics Circuits
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Basic Organization of Computers:** Classification Micro, Mini, Mainframe and Super Computer, Functional blocks of a computer, Bus Structure, Von- Neumann Architecture, Structure of IAS, CISC and RISC architectures and Computer Architecture.	**05 Hours**
Module-2	**Instruction Format:** instruction set, Three Address, Two Address, One Address and Zero Address Instruction. Instruction execution cycle, Fetching and storing a word in Memory, Types of addressing modes.	**05 Hours**
Module-3	**Data representation:** signed number representation, fixed and floating-point representations. Computer arithmetic – integer addition and subtraction multiplication -Booth multiplier, Fast multiplication, Division Algorithm, Floating Point Arithmetic Operation, Decimal Arithmetic Operation.	**08 Hours**
Module - 4	**Control Unit Operation:** Hardware Control & Micro Programmed Control, Peripheral devices and their characteristics: Input-output subsystems, I/O organization, I/O device interface, interrupt driven and DMA Controller.	**06 Hours**
Module - 5	**Pipelining:** Basic concepts of pipelining, Types of pipelining, representation of pipelining, throughput and speedup, pipeline hazards, Pipeline performance, Parallel Processors: Introduction to parallel processors and multi-core	**08 Hours**
Module- 6	**Memory Organization:** Computers Memory System Overview, Characteristicsof Memory System, Memory Hierarchy, Main Memory types, Memory cell Operation. **Cache Memory:** Cache Principles, Elements of Cache Design, Cache Size, Cache Mapping function, Write policy, Introduction to flash memory.	**08 Hours**
	Total	**40 Hours**

Text Books:	
1	Computer Organization – by V.CarlHamacher, Z.G.Vranesic, and S.G.Zaky, 5th Edition. McGraw Hill, ISBN-13: 978-8120332003.
Reference Books:	
1	Computer System Architecture: Morris Mano, 3rd Edition, PHI, ISBN-13. 978-8126522842.
2	Computer Organization & Architecture – William Stallings, 7th Edition, PHI, ISBN-13. 978-9332518704.
3	Computer Architecture and Organization: An Integrated Approach, Murdocca, Heuring Willey India, ISBN-13. 978-1259028564.
4	Computer Organization& Design, (3rd Edition) by – D.A.Patterson & J.L.Hennessy – Morgan Kaufmann Publishers (Elseviers), ISBN-13: 978-8120335110.
5	Computer Architecture and Organization, by - John P. Hayes, 3rd Edition, Mc Graw Hill International Editions, ISBN-13. 978-1259028564.
6	Computer Architecture: Parhami, Oxford University Press, . ISBN-13: 978-9381068311.

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

CO1	Identify Basic Organization of Computers.
CO2	Identify the addressing modes used in macro instructions.
CO3	Apply algorithms for arithmetic operations and implementation for ALU design.
CO4	Develop micro code for typical instructions in symbolic form.
CO5	Develop the pipeline and its performance.
CO6	Identify Characteristics of Memory System.

Type	Code	Digital Signal Processing	L-T-P	Credits	Marks
OE	BTEC-T-OE-403		3-0-1	3	150

Objectives	• To study the design techniques for FIR and IIR digital filters. • To study the finite word length effects in signal processing. • To study the properties of random signal, Multirate digital signal processing and about QMF filters.
Pre-Requisites	Knowledge of Physics and Mathematics in Secondary Education.
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topic	Hours
Module-1	**Signals:** Introduction, Classification: continuous/discrete-time signals, Representation of Discrete –time signals, Elementary Discrete –time signals, Classification of Discrete –time signals, Operation on Discrete –time signals. **Systems:** Introduction, Classification of Discrete –time systems :Static/Dynamic,Causal/Non-causal,Linear/Non-linear,Time-variant/time-invariant,FIR/IIR,Stable/Unstable ; Representation of arbitrary sequence using impulse function, Impulse response, Convolution Sum, Properties of convolution, , Correlation of two sequences.	**7 Hours**
Module-2	**The Z-Transform :** Introduction, Definition of Z-Transform, Z-Transform and ROC of finite duration sequences , Z-Transform and ROC of infinite duration sequences, ROC of two-sided sequence, Stability and ROC, Properties of ROC,	**6 Hours**
Module-3	Properties of the Z-transform, The System Function, Poles and Zeroes of a System function ,Stability Criterion .Inverse Z-Transform : Long Division Method, Partial fraction expansion method	**6 Hours**
Module-4	**The Discrete Fourier Transform :** Introduction to DFT & IDFT**,** properties of DFT**,** Comparison between circular convolution and linear convolution, Circular convolution of two sequences ,	**6 Hours**
Module-5	Filtering long duration sequences(overlap add and overlap save), Efficient computation of DFT: Fast Fourier Transform (FFT) Algorithm (Radix-2 DIT and Radix-2 DIF).	**7 Hours**
Module-6	**Digital filters :** Introduction(IIR/FIR filter),Realization of IIR filters :Direct form I, Direct form II, Signal flow graph, Transposed Structure , Cascade form, parallel form, Lattice structure, Lattice-Ladder Structure. Realization of FIR filters: Direct-Form Structure, Cascade-Form Structure, Linear phase, Lattice	**8 Hours**
Total		**40 Hours**

Text Books:	
1	J.G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and applications, 4thEdition, Prentice Hall India, 2007.
2	A.V.Oppenheim, A.S.Willsky, and S.H.Nawab, Signals and Systems, 2nd Edition, Prentice Hall India,1992.
3	S.K.Mitra, Digital Signal Processing: A Computer Based Approach, 4thEdition, Mc Graw Hill, 2013
Reference Books:	
1	L.R.Rabiner and B.Gold, Theory and Application of Digital Signal Processing,2nd Edition, Prentice Hall India,1992
2	.J.R.Johnson, Introduction to Digital Signal Processing, 2nd Edition, Prentice Hall India,1992.
3	A.N.Kani, Digital Signal Processing,2nd Edition, McGraw Hill Education,2017.
4	Computer Architecture and Organization, by - John P. Hayes, 3rd Edition, Mc Graw Hill International Editions
5	P.R. Babu, Digital Signal Processing,4th Edition, Sci tech Publication,2011.

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

CO1	Describe different types of signals, systems and their representation.
CO2	Explain the stability & Causality of LTI system.
CO3	Analyze various type of discrete time signal and system using z-transform.
CO4	Analyze discrete signal & System using DFT technique.
CO5	Realize different structure of FIR & IIR discrete time systems.
CO6	Design FIR & IIR filter using various technique.

Type	Code	Engineering Economics and Costing	L-T-P	Credits	Marks
HS	BTBS-T-HS-404		3-0-1	3	150

Objectives	• Account for the time value of money in economic analyses. • Make economic decisions using present worth, annual worth, future worth, and capitalized cost.
Pre-Requisites	Economic decisions involving engineering alternatives; annual cost, present worth, rate of return, and benefit-to-cost; before and after tax replacement economy; organizational financing; break-even charts; unit and minimum-cost public sector studies. Open only to junior and senior engineering students.
Teaching Pedagogy	Formal face-to-face lectures Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material. Small periodic quizzes, to enable you to assess your understanding of the concepts.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Engineering Economics-** Nature, Scope, Basic problems of an economy, Micro Economics and Macro Economics. **Demand** - Meaning of demand, Demand function, Law of Demand and its exceptions, Determinants of demand, Elasticity of demand & its measurement (Simple numerical problems to be solved), **Demand Forecasting –** Meaning SupplyMeaning of supply, Law of supply and its exception, Determinants of supply, Elasticity of supply, Determination of market equilibrium (Simple numerical problems to be solved).	**10 Hours**
Module-2	**Production -** Production function, Laws of returns: Law of variable proportion, Law of returns to scale Cost and Revenue Concepts - Total Costs, Fixed cost, Variable cost, Total revenue, Average revenue and Marginal revenue, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run, Analysis of cost minimization.	**08 Hours**
Module-3	**Market -** Basic understanding of different market structures, Determination of equilibrium price under perfect competition (Simple numerical problems to be solved), Break Even Analysis-linear approach (Simple numerical problems to be solved).	**07 Hours**
Module-4	**Time Value of Money-** Interest - Simple and compound, nominal and effective rate of interest, Cash flow diagrams, Principles of economic equivalence. **Evaluation of Engineering Projects-** Present worth method, Future worth method, Annual worth method, Internal rate of return method, Cost benefit analysis for public projects.	**06 Hours**
Module-5	**Depreciation-** Depreciation of capital assert, Causes of depreciation, Methods of calculating depreciation - Straight line method, Declining balance method, SOYD method, After tax comparison of project.	**04 Hours**
Module-6	**Inflation-**Meaning of inflation, types, causes, measures to control inflation. **National Income-**Definition, Concepts of national income, Method of measuring national income. **Banking -** Commercial bank, Functions of commercial bank, Central bank, Functions of Central Bank.	**05 Hours**
	Total	**40 Hours**

Text Books:	
1	Principles of Economics, Deviga Vengedasalam and Karaunagaran Madhavan, Oxford, ISBN-13 978-8120341678
2	Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India, ISBN-13: 978-8120341678.
Reference Books:	
1	C. S. Park, Contemporary Engineering Economics, 6th Edition, Pearson Education, 2015, ISBN-13 978-8120342095
2	Engineering Economy , William G.Sullivan, Elin M.Wicks, C. Patric Koelling, Pearson, ISBN-13 978-8120341678
3	"Engineering Economics", R.Paneer Seelvan, PHI, ISBN-13 978-8120341678
4	"Principles of Micro Economics" , Ahuja,H.L., S.Chand & Company Ltd, ISBN-13. 978-8120341678.
5	"Macro Economic Theory" Jhingan,M.L, Macro Economic Theory.

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

CO1	Remembering: Define the basic concept of micro and macroeconomics, engineering economics and their application in engineering economy.
CO2	Understanding: Evaluate numerically the effects of changes in demand and supply on price determination of products and services.
CO3	Analyze: the macroeconomic environment and financial systems of the country and its impact on business, society and enterprise.
CO4	Develop: the ability to account for time value of money using engineering economy factors and formulas.
CO5	Apply: knowledge of mathematics, economics and engineering principles to solve engineering problems and to analyze decision alternatives in engineering projects considering upon depreciation, taxes and inflation.
CO6	Understanding: Inflation and Banking.

Type	Code	PROGRAMMING WITH PYTHON	L-T-P	Credits	Marks
PC	BTCS-T-PC-405		3-0-1	3	150

Objectives	• Python is next generation multi-purpose programming language, that allows different users to create applications of various domains. • Students will be able to learn primary fundamentals of python programming and potential of python is to achieve modern computing requirements.
Pre-Requisites	Object oriented concepts, Programming fundamentals
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Introduction:** History of Python, Need of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations	**07 Hours**
Module-2	**ControlFlow-** if, if-elif-else, for, while, break, continue, pass. **Data structure:** Lists - Operations, Slicing, Tuples, Sets, Dictionaries, Sequences. Comprehensions.	**05 Hours**
Module-3	**Functions -** Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.	**06 Hours**
Module-4	**Object Oriented Programming OOP in Python:** Classes and objects, constructor, 'self-variable', Methods, Constructor Method, Inheritance and types of inheritance, Polymorphism , overloading and Overriding Methods, Data encapsulation, static variables	**08 Hours**
Module-5	**Python File Handling:** Open files, read from a file and write to a file. **Exception handling:** Errors and exceptions in Python, Try Except , Built-in exceptions, user defined exceptions	**06 Hours**
Module-6	**Brief Tour of the Standard Library -** Dates and Times, Matplotlib, Numpy, Pandas. **Modules:** Creating modules, importing modules	**08 Hours**
	Total	**40 Hours**

Text Book	
1	Python Programming: A Modern Approach, Vamsi Kurama, Pearson, ISBN-13. 978-1284175554.
Reference Books	
1	Core Python Programming, W.Chun, Pearson, ISBN-13. 978-9386052308.
2	Introduction to Python, Kenneth A. Lambert, Cengage, ISBN-13. 978-0132269933.
3	John V Guttag, ―Introduction to Computation and Programming Using Python ‘‘, Revised and expanded Edition, MIT Press, 2013, ISBN 13: 9780262525008.
4	Kenneth A. Lambert, ―Fundamentals of Python: First Programs,CENGAGE Learning, 2012, ISBN-13: 978-8131529034.
5	Charles Dierbach, ―Introduction to Computer Science using Python: A Computational Problem-solving Focus, Wiley India Edition, 2013, ISBN-13 978-8126556014
6	Learning Python, Mark Lutz, Orielly, ISBN-13. 978-1449355739.

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

CO1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.
CO2	Express proficiency in the handling of strings and functions
CO3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.
CO4	Develop micro code for typical instructions in symbolic form.
CO5	Identify the commonly used operations involving file systems
CO6	Articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.

Type	Code	NPTEL	L-T-P	Credits	Marks
OO	BTCS-T-OO-406		1-0-0	2	-

Objectives	The objective is to facilitate the competitiveness of Indian industry in the global markets through improving the quality of engineering education by providing high quality learning material available to students by the Indian Institutes of Technology (IIT) and Technical Teacher Training Institutes (TTTI).
Pre-Requisites	Knowledge of basic skill in every subject
Teaching Pedagogy	Regular classroom lectures provided by different course providers online or virtual mode.

List of Courses provided:

To be notified by the head of the department before the commencement of Fourth semester.

Type	Code	ABILITY ENHANCEMENT TRAINING - C	L-T-P	Credits	Marks
SC	BTSC-T-SC-407		1-0-0	1	100

Objectives	1. Defining the concepts of Indian tradition Knowledge 2. Understanding the importance of roots of knowledge system 3. Implementing the traditional knowledge to the day to day life 4. Distinguishing the types of traditional knowledge 5. Evaluating the ideas and teaching s of TK
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Traditional Knowledge **(Definition TK its Nature, characteristics and scope)**	**4 hrs**
Module-2	Protection and significance of Traditional knowledge **(Significance of TK Protection , Value of TK , role of Govt.to harness TK)**	**3 hrs**
Module-3	Legal Frame work and TK **(Forest Dwellers Forest right act 2001, 2002, 2006.)**	**3 hrs**
Module-4	Traditional knowledge and Intellectual property **(Systems & Legal concepts for the protection of traditional knowledge)**	**4 hrs**
Module-5	Traditional knowledge and Engineering **(Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge)**	**3 hrs**
Module-6	Importance of conservation and sustainable development of Management of Biodiversity **(Traditional societies dependence on environment , Food security of the country and protection of TK)**	**3 hrs**
	Total	**20 Hours**

Text Book	
1	Quantitative aptitude ,R S Aggarwal , ISBN-13: 978-0199488780
2	Quantitative Aptitude for CAT, Arun Sharma , ISBN-13. 978-9355321626.
Reference Books	
1	Fast Track Objective Arithmetic , Arihant Publications , ISBN-13: 9789312149836

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

CO1	Identify the concept of Traditional knowledge and its importance.
CO2	2. Explain the need and importance of protecting traditional knowledge.
CO3	3. Illustrate the various enactments related to the protection of traditional knowledge.
CO4	4. Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO5	5. Explain the importance of Traditional knowledge in Agriculture and Medicine.
CO6	Identify Characteristics of Memory System.

Type	Code	Design and Analysis of Algorithms Lab	L-T-P	Credits	Marks
PC	BTCS-P-PC-401		3-0-1	3	100

Objectives	• Analyze the asymptotic performance of algorithms. • Write rigorous correctness proofs for algorithms. • Demonstrate a familiarity with major algorithms and data structures.
Pre-Requisites	Knowledge of Mathematics in Secondary Education, Data Structure and Exposer to any programming Language.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Implementation of different searching algorithms.	2 Hours
2	Implementation of different sorting algorithms.	2 Hours
3	Problem solving using Divide and Conquer technique.	2 Hours
4	Problem solving using Dynamic Programming technique.	2 Hours
5	Problem solving using Greedy technique.	2 Hours
6	Implementation of Graph Traversal algorithms – Breadth-First-Search (BFS) and Depth-First-Search (DFS).	2 Hours
7	Implementation of Minimum Spanning Tree construction algorithms – Kruskal and Prim.	2 Hours
8	Problem solving for the Shortest Path problems.	2 Hours
9	Problem solving using Backtracking technique.	2 Hours
10	Problem solving using Branch and Bound technique.	2 Hours
11	Implementation of different String-Matching algorithms.	2 Hours
12	Problem solving using disjoint-set data structure operations.	2 Hours
13	Problem solving using Approximation algorithms.	2 Hours

Text Books:

Design and Analysis of Algorithms Lab Manual, Department of CSE, GIFT, Bhubaneswar, ISBN-13. 978-1983074165.

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

CO1	Analyse and compare running times of algorithms using asymptotic analysis.
CO2	To demonstrate understanding of algorithmic design paradigms such as divide-and-conquer, dynamic-programming, greedy, backtracking etc.
CO3	Apply the algorithms design techniques to solve greedy problem.
CO4	Ability to analyse and implement shortest path problem.
CO5	Demonstrate the efficiency of algorithms using polynomial problem.
CO6	Implement minimum spanning tree and analyse time complexity.

Type	Code	Computer Organization and Architecture Lab	L-T-P	Credits	Marks
PC	BTCS-P-PC-402		0-0-3	1	100

Objectives	Discuss the basic concepts and structure of computers. Understand concepts of register transfer logic and arithmetic operations. Explain different types of addressing modes and memory organization.
Pre-Requisites	Knowledge of fundamentals of Computer and C programming Language.
Teaching Pedagoy	Regular Lab with use of ICT. Each session is planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Identification of different components of a PC.	**2 Hours**
2	Assembling and Disassembling of a PC.	**2 Hours**
3	Study of Motherboard and its Installation.	**2 Hours**
4	Study of the functions of SMPS trainer kit.	**2 Hours**
5	Study of different types of printer trainer kit.	**2 Hours**
6	Study of Assembly language programs.	**2 Hours**
7	Study of different troubleshooting of CPU using CPU trainer kit.	**2 Hours**
8	Familiarization of different types of bytes addressing instruction using 8085/8086 simulators.	**2 Hours**
9	Write a C/C++ program to perform signed bit multiplication using Booth's Algorithm.	**2 Hours**
10	Write a C/C++ program for IEEE-754 floating point representation and perform Addition/Subtraction.	**2 Hours**

Text Books:
Computer Organization and Architecture Lab Manual, Department of CSE, GIFT, Bhubaneswar, ISBN-13: 978-8120332003

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

CO1	Identifying the various components of PC.
CO2	Discuss about the different troubleshooting of a dot matrix printer using LX 1050+Printer Trainer Module.
CO3	Demonstrate the functions of SMPS using SMPS Trainer Kit.
CO4	Illustrate different troubleshooting of CPU using CPU Trainer Module.
CO5	Compare the assembly language program of 8085 and 8086architecture.
CO6	To have the knowledge about Logic gate

Type	Code	PYTHON Lab	L-T-P	Credits	Marks
PC	BTCS-P-PC-405		0-0-3	1	100

Objectives	• To convert an algorithm into a Python program. • To construct Python programs with control structures. • To structure a Python Program as a set of functions.
Pre-Requisites	Knowledge of Digital Electronics Circuits
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Python control statement	**2 Hours**
2	Program on data type using Python.	**2 Hours**
3	Program on matrix operation using Python	**2 Hours**
4	Program on Function using Python.	**2 Hours**
5	Program on String operation in python.	**2 Hours**
6	Program on object-oriented concept using python.	**2 Hours**
7	File handling in Python.	**2 Hours**
8	Program related to uses of Python modules (NumPy, Pandas)	**2 Hours**
9	Python programming using Matplotlib	**2 Hours**
10	Python programming for linear regression	**2 Hours**

Text Books:
PYTHON Lab Manual, Department of CSE, GIFT, Bhubaneswar, ISBN-13: 978-1491957660

Course Outcomes:

CO1	Understand the basic concept of Script language.
CO2	Demonstrating the control statement in python
CO3	Experiment on different datatypes in python.
CO4	Ability to explore python especially the object-oriented concepts, and the built in objects of
CO5	Implementation of Python Modules.
CO6	Ability to Create practical and contemporary applications on Machine learning.

Type	Code	Project-III	L-T-P	Credits	Marks
PS	BTCS-P-PS-408		3-0-1	2	150

Objectives	The objective is to analyze the designing process of combinational and sequential circuits, express arithmetic logic and shift micro-operations, identify the addressing modes used in macro instructions, apply algorithms for arithmetic operations and implementation for ALU design.
Pre-Requisites	Knowledge of Digital Electronics Circuits.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples.

Detailed Syllabus

Projects using C Programing

1) Unit Converter
2) Customer Billing System in a shopping mall
3) Banking Management System
4) University Grading System
5) Bus Ticket Reservation System
6) Home Automation System
7) Digital Wall Clock
8) Book Support Automation
9) Lab Management System
10) Nursery Management System

Arduino based Project

1) Obstacle detection using Arduino
2) Controlling 4 LEDs to make different patterns
3) Voice Activation System
4) Use Humidity Sensor using Arduino
5) Arduino Based Color Detector
6) Touch Dimmer Switch Circuit Using Arduino
7) Wireless Door Bell
8) Arduino Traffic Light Controller
9) Frequency Counter Using Arduino
10) Arduino 4-Digit 7-Segment LED Display
11) Arduino based Digital Thermometer
12) Arduino Light Sensor
13) Portable Ultrasonic Range Meter
14) Security Alarm System Using Arduino
15) Arduino Alarm Clock
16) Interfacing LCD with Arduino

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

CO1	Identify Basic Organization of Computers.
CO2	Identify the addressing modes used in macro instructions.
CO3	Apply algorithms for arithmetic operations and implementation for ALU design.
CO4	Develop micro code for typical instructions in symbolic form.
CO5	Develop the pipeline and its performance.
CO6	Identify Characteristics of Memory System.

Part 3
3rd Year B. Tech. (Computer Science & Engineering)

Contents

Third Year B.Tech

Curriculum Structure

B. Tech (CSE) (5th Semester & 6th Semester)

Detailed Syllabus

Practical

Type	Code		L-T-P	Credits	Marks
PC	**BTCS-T-PC-501**	**ARTIFICIAL INTELLIGENCE**	3-0-0	3	200

Objectives	1. Understand the basic concepts of Artificial Intelligence and applications of search algorithms for problem solving. 2. Learn about advance search algorithms and knowledge representation. 3. Study different learning techniques and get awareness about Ethics and Safety in AI.
Pre-Requisites	Basic knowledge of algorithm and mathematics.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction –The Foundations of Artificial Intelligence, INTELLIGENT AGENTS – Agents and Environments, Good Behavior: The Concept of Rationality, the Nature of Environments, the Structure of Agents.	**07 Hours**
Module-2	**Solving problems by search - 1:** Problem-Solving Agents, formulating problems, Searching for Solutions, Uninformed Search Strategies, Breadth-first search, Depth-first search, Searching with Partial Information.	**08 Hours**
Module-3	**Solving problems by search – 2:** Informed (Heuristic) Search Strategies, Greedy best-first search, A* Search, CSP, Means- End-Analysis. Advanced Search: Constructing Search Trees, Stochastic Search, Minimax Search, Alpha-Beta Pruning Basic knowledge.	**08 Hours**
Module-4	**Knowledge Representation and Reasoning:** Propositional logic, Predicate logic, First order logic, Inference in first order logic, Clause form conversion, Resolution. Chaining- concept, forward chaining and backward chaining, Utility theory and Probabilistic reasoning, Hidden Markov model, Bayesian Networks.	**08 Hours**
Module-5	**Learning:** Forms of Learning, Supervised Learning, Learning Decision Trees Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.	**08 Hours**
Module-6	**Ethics and Safety in AI:** Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.	**06 Hours**
Total		**45 Hours**

Text Book
1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill,3rd ed.,2017 ISBN-13 9780070087705
2. Stuart Russell, Peter Norvig, Artificial Intelligence -A Modern Approach, 2/e, Pearson, 2003, ISBN - 9780134610993

Reference Books	
1	Nils J Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publications,2000, ISBN-13 978-1558604674
2	Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010, ISBN-13: 978-8120307773
3	Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010, *ISBN*-13: 978-8120307773
4	S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011, ISBN-13 978-8131510995

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

CO.1	Understand the fundamental concepts, theories, and principles of Artificial Intelligence to architect intelligent agents.
CO.2	Acquire knowledge about different search techniques of AI applications.
CO.3	Develop practical skills to identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.
CO.4	Learn techniques for logic, reasoning & knowledge representation in AI.
CO.5	Learn the basics of Machine Learning as a subfield of Artificial Intelligence area.
CO.6	Apply AI applications to solve and analyze real world problems.

Type	Code	SOFTWARE ENGINEERING	L-T-P	Credits	Marks
PC	**BTCS-T-PC-502**		3-0-0	3	200

Objectives	1. An ability to work in one or more significant application domains 2. Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle 3. Demonstrate an ability to use the techniques and tools necessary for engineering practice
Pre-Requisites	To identify different software development models
Teaching Pedagogy	To apply software engineering knowledge in real-world problem solving

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Software Process Models**: Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, and Scrum.	**10 Hours**
Module-2	**Software Requirements Engineering:** Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification (SRS), Decision tables and trees.	**05 Hours**
Module-3	**Structured Analysis & Design:** Overview of design process, High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design.	**06 Hours**
Module-4	**Coding and Software Testing Techniques:** Coding, Code Review, documentation. **Testing**: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing.	**07 Hours**
Module-5	**Product metrics:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.	**05 Hours**
Module-6	**Maintenance:** Basic concepts in software reliability, reliability measures, reliability growth modelling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse.	**07 Hours**
Total		**40 Hours**

Text Book	
1. Rajib Mall(2014)Fundamentals of Software Engineering, Prentice-Hall of India Pvt. Ltd, ISBN-978-81-203-4898-1	
Reference Books	
1	Craig Larman, "Applying UML and Patterns" Third edition, Pearson Education, 2005,ISBN-13 978-0131489066
2	Stephen Schach, "Software Engineering" Seventh edition, McGraw-Hill, 2007, ISBN-13: 978-0070647770
3	Ivar Jacobson, Grandy Booch, James Rumbaugh, "The Unified Software Development Process", Pearson Education, 1999, ISBN 0-8053-0604-8
4	Alistair Cockburn, "Agile Software Development" Second edition, Pearson Education, 2007, ISBN 0-321-482751

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

CO.1	To learn object-oriented (OO) analysis and design using UML and other techniques.
CO.2	To acquire knowledge how to OO languages support abstraction and polymorphism.
CO.3	To develop an agile software process, with multiple iterations, design patterns, test-driven development & pair programming.
CO.4	To improve communications skills in the contact of software development. Students will present project ideas, analyses, designs, and prototypes.
CO.5	Ability to abstract object-based views for generic software systems.
CO.6	To explore specialized topics in OO software.

Type	Code	OPERATING SYSTEMS	L-T-P	Credits	Marks
PC	**BTCS-T-PC-503**		3-0-0	3	200

Objectives	1. Students will learn how Operating System is Important for Computer System. 2. To make aware of different types of Operating System and their services. 3. To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system
Pre-Requisites	Basic concept of computer science and algorithm.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**INTRODUCTION TO OPERATING SYSTEM:** Fundamentals of OS, Batch Systems, Multiprogramming and Time-Sharing systems. Personal Computer Systems, Parallel Systems, Distributed Systems and Real time Systems. Operating System Structures: Operating System Services, System components, Protection, Operating System Services, system calls	**6 Hours**
Module-2	**PROCESS MANAGEMENT:** Process Concept, Process Scheduling, Operation on Processes, inter-process communication, Examples of IPC Systems, Multithreading Models, Threading Issues, Process Scheduling Basic concepts, scheduling criteria, scheduling algorithms.	**5 Hours**
Module -3	**PROCESS COORDINATION:** Synchronization: The Critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors. Deadlocks: System model, Deadlock Characterization Methods for Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection, recovery from Deadlock.	**7 Hours**
Module -4	**MEMORY MANAGEMENT:** Memory Management strategies, Logical versus Physical Address space, swapping, contiguous Allocation, Paging, Segmentation. **Virtual Memory:** Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms. Allocation of frames, Thrashing, Demand Segmentation.	**7 Hours**
Module -5	**STORAGE MANAGEMENT:** File System Concept, Access Methods, File System Structure, File System Structure, File System Implementation, Directory implementation, Efficiency and Performance, Recovery, Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, I/O System Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Request to Hardware Operation. CASE STUDIES: The LINUX System, Windows XP,	**10 Hours**
Module -6	**Distributed Systems:** Distributed operating systems –Distributed file systems –Distributed Synchronization	**5 Hours**
Total		**40 Hours**

Text Books:	
1	**Operating System Concepts –** Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 8th edition, Wiley-India, 2009, ISBN-13 978-0470233993
Reference Books:	
1	**Operating Systems –** Flynn, McHoes, Cengage Learning, ISBN-13. 978-1285096551
2	**Operating Systems –** Pabitra Pal Choudhury, PHI, ISBN : 9788120338111
3	**Operating Systems –** William Stallings, Prentice Hall, ISBN-13: 978-9332518803
4	**Operating Systems –** H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson, ISBN-13. 978-0131828278
5	**Modern Operating Systems –** Andrew S. Tanenbaum, 3rd Edition, PHI, ISBN-13 978-8120339040
6	**Operating Systems:** A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition, ISBN-13 978-0072449815

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

CO.1	Define Operating system, process, critical section, semaphore, monitor, thread, deadlock, virtual memory, file, protection and security.
CO.2	Explain Operating system functions and services, process control block and process cycle, Describe characteristics for deadlock handling strategies, paging, segmentation, different file systems.
CO.3	Solve problems on CPU scheduling, dead lock avoidance, paging and disk scheduling.
CO.4	Analyze different operating system structures and different CPU scheduling algorithms, file structures.
CO.5	Compare paging and segmentation, page replacement algorithms, disk scheduling mechanisms.
CO.6	Prepare a list of functionality requirement specification of an operating system for a real world scenario.

Type	Code	FORMAL LANGUAGES & AUTOMATA THEORY	L-T-P	Credits	Marks
PC	**BTCS-T-PC-504**		3-0-0	3	200

Objectives	1. To introduce concepts in automata theory and theory of computation. 2. To identify different formal language classes and their relationships. 3. To design grammars and recognizers for different formal languages.
Pre-Requisites	Basic knowledge of discrete mathematics is required.
Teaching Pedagogy	Regular classroom lectures with use of ICT as required; sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Module-#	**Topics**	**Hours**
Module-1	**Introduction:** Automata theory, Computability theory, Complexity theory, Mathematical notations & terminology, Alphabet, String, Languages & operations on strings; Finite Automata (Deterministic): Formal definition, Transition function, Extended transition function, Language of DFA, Design of DFA; Finite Automata (Non-deterministic): Formal definition, Language of NFA, Equivalence of DFA & NFA; NFA with Epsilon Transition: Eliminating ε-transitions from NFA, Conversion from Epsilon-NFA to DFA, Minimization of DFA.	**7 Hours**
Module-2	**Moore Machines, Mealy Machines; Regular Expressions:** Operators and their precedence, Building Regular expressions, DFA to Regular Expressions, Regular Expressions to DFA, Arden's theorem, Pumping Lemma for Regular Languages, Closure properties of Regular languages.	**7 Hours**
Module-3	**Introduction to Grammars:** Definition, Derivation of string, Regular grammars; Context Free Grammars: Definition, Derivation of string, Language of CFG, Parse Tree, Ambiguity in grammar, Elimination of ambiguity.	**6 Hours**
Module-4	Normal forms of CFG: Chomsky and Greibach Normal forms, Converting CFG to CNF & GNF, Closure Properties of context free languages. **Push Down Automata:** Basic Model, Components, Moves of a PDA, ID Of a PDA, Design of a PDA.	**7 Hours**
Module-5	**Turing Machines:** Model, Components, ID of TM, Design of a TM, Variation of TM model, Recursively Enumerable Languages, Universal Turing Machine and undesirable problems.	**5 Hours**
Module-6	Church Turing hypothesis, Recursive and recursively enumerable sets, Chomsky's hierarchy of languages. Undecidability of Post correspondence problem, Linear Bounded Automata and Ackermann's function, Turing computable functions, Cantor and Godel numbering; NP Completeness: P and NP, NP complete and NP Hard problems	**8 Hours**
Total		**40 Hours**

Text Book	
1	J. E. Hopcroft, R. Motwani, and J. D. Ullman, Introduction to Automata Theory, Languages and Computation, Pearson Education, 2007, ISBN 978-1292039053
Reference Books	
1	M. Sipser, Introduction to the Theory of Computation, Cengage Learning, 2012, ISBN: 9788131525296
2	J. C. Martin, Introduction to Languages and the Theory of Computation, Tata McGraw-Hill, 2010, ISBN-0071198547
3	K. L. P. Mishra, and N. Chandrasekaran, Theory of Computer Science: Automata, Languages and Computation, , PHI, 2012, ISBN-10 9788120329683

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

CO.1	Develop and implement mathematical models with DFA, NFA for regular languages and grammar for real life applications.
CO.2	Design and implement grammar and PDA for context free languages and demonstrate their Properties.
CO.3	Construct Turing machines for context sensitive and un-restricted languages
CO.4	Describe the Chomsky hierarchy of Formal Languages and Grammar.
CO.5	Illustrate the relevance of the Church-Turing thesis, explain the concept of decidability.
CO.6	Recursive innumerability, and classify a given language to the P, NP or NPC complexity classes

Type	Code	WEB DESIGN AND DEVELOPMENT	L-T-P	Credits	Marks
PE	**BTCS-T-PE-501**		3-0-0	3	200

Objectives	1. To introduce the fundamentals of Internet, and the principles of web design. 2. To construct basic websites using HTML and Cascading Style Sheets. 3. To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
Pre-Requisites	Basic knowledge about website and browser.
Teaching Pedagogy	Regular classroom lectures with use of ICT as needed. Each session is planned to be interactive with focus on real-world problem solving through case lets.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Internet Architecture: History of internet, Topology, WWW, LAN, MAN, WAN, Access VS Core Networks, Routers, Transmission Media, ISPs. OSI model, TCP/IP model, TCP/IP vs OSI model.	06 Hours
Module-2	HTML: Structure of HTML Documents, Document Types HTML Elements and attributes: Common HTML tags, List, Anchor, Image, Link, Table.	07 Hours
Module-3	Image Map: Client-Side Image Maps and Server-Side Image Maps. Create Client side image map using Area. HTML Forms: Form Elements and its attributes CSS: Style Sheet Basic, Properties, Selectors and Positioning of Style Sheet. Dynamic HTML.	06 Hours
Module -4	Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Programming: Text Editors / Integrated Development Environments (IDEs), Variable (var and let), constant, data types, Comment lines. Operators, Statements, Conditional statements, function: import, export, labelled, return	07 Hours
Module -5	JavaScript (Properties and Methods of Each): Array, Boolean, Date, Function, Math, Number, Object, String, regExp. Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer. Events and Event Handlers: Introduction of Events, Defining Event	07 Hours
Module-6	Frameworks / Libraries of Java Script: Introduction to React.js and node.js Java Script Databases: Introduction to MongoDB Extended Reality (XR), Voice Search and Assistants, Servlet.	07 Hours
Total		**40 Hours**

Text Book	
1	Computer Networking: A Top-Down Approach Featuring the Internet by Kurose and Ross, Pearson, ISBN-13. 978-0133594140
2	Web Design the Complete Reference by Thomas Powell, Tata McGraw-Hill, ISBN-13 978-0072122978
Reference Books	
1	JavaScript the Complete Reference, Second Edition by Thomas Powell, Fritz Schneider. Tata McGrawHill, ISBN-13: 978-0072253573
2	HTML The Complete Reference by Thomas Powell, Tata McGraw-Hill, ISBN-13. 978-0070582811

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

CO.1	Describe the concepts of World Wide Web, and the requirements of effective web design.
CO.2	Develop web pages using the HTML and CSS features with different layouts as per need of applications.
CO.3	Use the JavaScript to develop the dynamic web pages.
CO.4	Construct simple web pages in PHP and to represent data in XML format.
CO.5	Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.
CO.6	Use JQuery for developing the Web Pages, develop Static webpage/web portal.

Type	Code	ABILITY ENHANCEMENT TRAINING - D	L-T-P	Credits	Marks
AE	**BTCS-T-AE-501**		2-0-0	1	100

Objectives	1. To develop analytical abilities 2. To develop communication skills 3. To introduce the students to skills necessary for getting, keeping and being successful in a profession. 4. To expose the students to leadership and team-building skills.
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Basics, Structure of C program, Tokens, Control Statements, Arrays and Strings. Functions and Pointers, Structures, unions and File Handling.	**04 Hours**
Module-2	Java oops, continues java oops and string.	**03 Hours**
Module -3	Java exception handling, java inner classes, java conversions	**03 Hours**
Module -4	Database Basics, Architecture, Codds Rule, Relational Algebra (Theory and SQL) Joins (Theory and SQL), ER Diagram.	**03 Hours**
Module -5	Dependencies : Functional Dependency, Partial Dependency, Transitive Dependency , Multi Valued Dependency Normalization :1 NF, 2 NF,3 NF & BCNF, 4&5 NF	**03 Hours**
Module-6	Understanding of HTML, Overview of CSS, JavaScript, JavaScript Methods, DOM Model and Form Handling.	**04 Hours**
Total		**20 Hours**

Text Book	
1	Programming in ASCI C, 8th Edition by E Balaguruswamy,ISBN-10-935316513X
2	Core Java Volume I- Fundamentals ,Cay S. Horstmann, Gary Cornell Pearson India Education Services Pvt. Ltd., Eleventh Edition

Reference Books	
1	C Programming in easy steps, 5th Edition,Mike McGrath
2	The Java Language Specification, J. Gosling, Bill Joy, Jr. Steele, Guy L., Gilad Bracha, Alex Buckley, Guy L. Steele Jr.
3	Data Base Management System, Raghu Ramakrishnan and Johannes Gehrke
4	Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics,5th Edition,Jennifer Robbins
5	Database Systems: The Complete Book , Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom
6	HTML & CSS: The Complete Reference, 5th Edition ,Thomas A. Powell,ISBN: 978-0-07-174170-5

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

CO.1	Learn all the basic skill on c programming.
CO.2	Develop problem solving and programming skills using OOP concepts.
CO.3	Apply the concept of Exception Handling, inner classes, conversions.
CO.4	Understand data models to design a database.
CO.5	Apply normalization on database for eliminating redundancy.
CO.6	Understanding the internet Architecture and html, CSS and JavaScript.

Type	Code	ESSENCE OF INDIAN KNOWLEDGE AND TRADITION - II	L-T-P	Credits	Marks
MC	**BTCS-T-MC-501**		0-0-0	0	100

Objectives	1. Defining the concepts of Indian tradition Knowledge 2. Understanding the importance of roots of knowledge system 3. Implementing the traditional knowledge to the day to day life 4. Distinguishing the types of traditional knowledge 5. Evaluating the ideas and teaching s of TK
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to Traditional Knowledge (Definition TK its Nature, characteristics and scope)	**04 Hours**
Module-2	Protection and significance of Traditional knowledge (Significance of TK Protection , Value of TK , role of Govt.to harness TK)	**03 Hours**
Module -3	Legal Frame work and TK(Forest Dwellers Forest right act 2001, 2002, 2006.)	**03 Hours**
Module -4	Traditional knowledge and Intellectual property (Systems & Legal concepts for the protection of traditional knowledge)	**04 Hours**
Module -5	Traditional knowledge and Engineering (Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge)	**03 Hour**
Module -6	Importance of conservation and sustainable development of environment Management of Biodiversity (Traditional societies dependence on environment , Food security of the country and protection of TK)	**03 Hours**
Total		**20 Hours**

Text Book	
1	**Indian Philosophy** by S. Radhakrishnan, ISBN-13: 978-0195638204
2	**The Cultural Heritage of India** edited by Kapila Vatsyayan, ISBN-13: 978-8173050545
Reference Books	
1	**Indian Art and Culture** by Nitin Singhania, ISBN-13: 978-9384761548

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

CO.1	Ability to understand, connect up and explain basics of Indian Traditional knowledge Modern scientific perspective.
CO.2	Identify the concept of Traditional knowledge and its importance.
CO.3	Explain the need and importance of protecting traditional knowledge.
CO.4	Illustrate the various enactments related to the protection of traditional knowledge.
CO.5	Interpret the concepts of Intellectual property to protect the traditional knowledge.
CO.6	Explain the importance of Traditional knowledge in Agriculture and Medicine.

Type	Code	ARTIFICIAL INTELLIGENCE LAB	L-T-P	Credits	Marks
PC	**BTCS-P-PC-501**		0-0-2	1	100

Objectives	1. Understand the basic concepts of Artificial Intelligence and applications of search algorithms for problem solving. 2. Learn about advance search algorithms and knowledge representation. 3. Understand and apply different learning techniques and get awareness about Ethics and Safety in AI.
Pre-Requisites	A basic knowledge of algorithm, mathematics.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Write a program to implement BFS and DFS	2 Hours
2	Write a program to implement Greedy BFS	2 Hours
3	Write a program to implement A* Search Algorithm	2 Hours
4	Write a program to implement Min-Max Algorithm	2 Hours
5	Study of PROLOG(Pre-Requisite)	2 Hours
6	Write a program to implement simple facts and Queries	2 Hours
7	Write a program to implement simple arithmetic	2 Hours
8	Write a program to solve Tower of Hanoi	2 Hours
9	Write a program to solve 8 Puzzle problems	2 Hours
10	Write a program to solve Monkey banana problem	2 Hours
11	Write a program for Water jug problem	2 Hours

Text Books:	
1	Artificial Intelligence Lab Manual, Department of CSE, GIFT, Bhubaneswar

CO.1	Apply the good programming skills to formulate the solutions for computational problems
CO.2	Design and develop solutions for informed and uninformed search problems in AI.
CO.3	Demonstrate the submission of small problems using prolog programming and implement various AI algorithms.
CO.4	Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area.
CO.5	Evaluate the performance by developing a minor project in multidisciplinary areas to demonstrate team work through reports and presentation.
CO.6	Design and develop an Expert System that operates in a realistic problem domain and communicate effectively in a team or individual and prepare reports.

Type	Code	SOFTWARE ENGINEERING LAB	L-T-P	Credits	Marks
PC	**BTCS-P-PC-502**		0-0-2	1	100

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements.	2 Hours
2	Develop DFD Model (Level 0, Level 1 DFD and data dictionary) of the sample problem (Use of a CASE tool required)	2 Hours
3	Develop structured design for the DFD model developed	2 Hours
4	Develop UML Use case model for a problem (Use of a CASE tool any of Rational rose, Argo UML, or Visual Paradigm etc. is required)	2 Hours
5	Develop Sequence Diagrams using visual paradigm / lucidchart/ SmartDraw .	2 Hours
6	Develop Class Diagrams using visual paradigm / lucidchart/ SmartDraw .	2 Hours
7	Develop code for the developed class model using Java.	2 Hours
8	Use open source testing tool like JUnit.	2 Hours
9	Develop Object Diagrams using visual paradigm / lucidchart/ SmartDraw .	2 Hours
10	Create an ER diagram for the assigned project.	2 Hours

Text Book

1. Pressman, R.S. (2010) Software Engineering: A Practitioner's Approach. 7th Edition, McGraw Hill, New York, ISBN-13 978-0071267823
2. Rajib Mall(2014)Fundamentals of Software Engineering, Prentice-Hall of India Pvt. Ltd, ISBN-978-81-203-4898-1
3. Bernd Bruegge, Alan H Dutoit, "Object-Oriented Software Engineering" Second edition, Pearson Education, 2004, ISBN-13: 978-0136061250

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

CO.1	Outline the SRS for different functional and non-functional requirements.
CO.2	Understand the software engineering methodologies involved in the phases for software development.
CO.3	Solve the DFD of various models.
CO.4	Ability to develop product start-up and implementing software process models in software engineering methods.
CO.5	Select the various testing tools for software mechanisms.
CO.6	Build project management tool like MS Project or Gantt Project.

Type	Code	OPERATING SYSTEMS LAB	L-T-P	Credits	Marks
PC	BTCS-P-PC-503		0-0-2	1	100

Objectives	1. Students will learn how Operating System is Important for Computer System. 2. To make aware of different types of Operating System and their services. 3. To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system
Pre-Requisites	Basic concept of computer science and algorithm.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on problem solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Basic UNIX Commands.	2 Hours
2	Linux Administrative commands.	2 Hours
3	UNIX Shell Programming.	2 Hours
4	Programs on UNIX System calls.	2 Hours
5	Write a program to create a process. Explain the process synchronization using producer consumer process.	2 Hours
6	Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing)	2 Hours
7	Write a program to simulate First Fit, Best Fit and Worst Fit algorithm.	2 Hours
8	Simulation of Banker's Algorithm for Deadlock Avoidance, Prevention	2 Hours
9	Program for FIFO, LRU, and OPTIMAL page replacement algorithm.	2 Hours
10	Write a program to simulate DISK scheduling.	2 Hours

Text Books:	
1	Operating Systems Lab Manual, Department of CSE, GIFT, Bhubaneswar

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

CO.1	Remember and use of various Linux commands and UNIX system calls.
CO.2	Interpret the commands using different parameters.
CO.3	Demonstrate the submission of small problems using shell programming and implement various OS algorithms.
CO.4	Analyze the shared memory and message queue communication among processes.
CO.5	Evaluate their performance of different page replacement algorithms with respect to page fault through simulation.
CO.6	Build one program to check whether there will be deadlock or not for any given real-world problem.

Type	Code	SEMINAR-2	L-T-P	Credits	Marks
PS	**BTCS-P-PS-501**		0-0-2	1	100

Objectives	1. To encourage the students to study advanced engineering developments 2. To prepare and present technical reports. 3. To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
Pre-Requisites	Knowledge of Speaking with globally accepted language and subject analysis.
Teaching Pedagogy	Regular seminar presentation and evaluation with record keeping.

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

CO.1	Outline the topics on modern technology; prepare implementation of the same as the presentation.
CO.2	Understanding the technologies used by extracting the new things to be implemented by reviewing the journals/research papers.
CO.3	Sketch the application of the technology for the use of the mankind.
CO.4	Analyse and correlate the new technology with the subject of interest for further study.
CO.5	Evaluate, plan and reframe the technology with the communication skills for a better explanation and presentation.
CO.6	Modify and design the concept into the realistic world.

Type	Code	EVALUATION OF SUMMER INTERNSHIP-2	L-T-P	Credits	Marks
PS	**BTCS-P-PS-502**		0-0-2	1	100

Objectives	1. To encourage the students to study advanced engineering developments 2. To prepare and present technical reports. 3. To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
Pre-Requisites	Knowledge of Speaking with globally accepted language, subject analysis, practical implementation.
Teaching Pedagogy	Regular contact with interns and evaluation with record keeping.

METHOD OF EVALUATION:

1. During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes.
2. In a session of one period per week, 5 students are expected to present the seminar.
3. Each student is expected to present at least twice during the semester and the student is evaluated based on that.
4. At the end of the semester, he / she should submit a report on his / her topic of seminar and marks are given based on the report.
5. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.

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

CO.1	State the functioning of organization and observe changes for self-improvement.
CO.2	Explain how the internship placement site fits into a broader career field.
CO.3	Apply appropriate workplace behaviours in a professional setting.
CO.4	Solve real life challenges in the workplace by analysing work environment and conditions, and
CO.5	Evaluate the internship experience in terms of personal, educational and career needs.
CO.6	Develop ideas for suitable startups to become successful entrepreneur.

Sixth Semester

Type	Code	OPTIMIZATION ENGINEERING	L-T-P	Credits	Marks
BS	**BTCS-P-BS-601**		3-1-0	4	200

Objectives	1. Inculcate modeling skills necessary to describe and formulate optimization problems in design and manufacturing 2. Familiarize with the working principle of optimization algorithms used to solve linear and non-linear problems 3. Train the students to solve optimization problems using software tools
Pre-Requisites	Knowledge of Mathematics in Secondary Education, Data Structure and Exposer to any programming Language.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	**Topics**	**Hours**
Module-1	Idea of engineering optimization problems, modeling of problems and principle of modeling, Linear Programming: Formulation of LPP, Graphical solution,	**6 Hours**
Module-2	Simplex method, Big-M method, Dual simplex method, Duality theory.	**8 Hours**
Module-3	Transportation problems: Finding an initial basic feasible solution by Northwest Corner rule, Least Cost rule, Vogel's approximation method, Degeneracy, Optimality test, MODI method, Assignment problems: Hungarian method for solution of Assignment problems. Travelling Salesman problem.	**10 Hours**
Module-4	Non-linear programming: Introduction to non-linear programming. Unconstraint optimization: Fibonacci and Golden Section Search method	**6 Hours**
Module-5	Non-linear programming problem: Constrained optimization with equality constraint: Lagrange multiplier method. Constrained optimization with inequality constraint: Kuhn-Tucker condition.	**6 Hours**
Module-6	Inventory Theory: General characteristics, Deterministic Inventory models: EOQ model with constant rate of demand, different rates of demand, EPQ Model.	**9 Hours**
Total		**45 Hours**

Books	
1	Operation Research: J K Sharma Macmillan India Ltd, ISBN-10 1403931518
2	Operation Research, Prabhakar Pai ,Oxford University Press, ISBN-10 0198075472
3	Operations Research, P.K.Gupta, D.S.Hira, S.Chand and Company Ltd, 2014, ISBN-13: 978-1212121844
4	Operations Research, H.A.Taha, A.M.Natarajan, P.Balasubramanie, A.Tamilarasi, Pearson Education, Eighth Edition, ISBN 9780134444017
5	Engineering Optimization, S S Rao, New Age International Pvt Ltd, 2003, ISBN-13. 978-9395161800
6	Engineering Optimization, A.Ravindran, K.M.Ragsdell, G.V.Reklaitis, Wiley India Pvt. Ltd, Second edition, ISBN 978-0-470-18352-6
7	Operations Research, F.S.Hiller, G.J.Lieberman, Tata McGraw Hill, Eighth Edition, 2005,ISBN-10 0070600929

Digital Learning Resource:

Course Name: Foundations of Optimization
Course Link: https://nptel.ac.in/courses/111/104/111104071/
Course Instructor: Dr. Joydeep Dutta, IIT Kanpur

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

CO.1	Apply basic concepts of mathematics to formulate an optimization problem.
CO.2	Analyze and appreciate variety of performance measures for various optimization problems.
CO.3	To understand importance of optimization in different sectors.
CO.4	To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
CO.5	To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.
CO.6	To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

Type	Code	COMPILER DESIGN	L-T-P	Credits	Marks
PC	**BTCS-T-PC-601**		3-0-0	3	200

Objectives	1. To inculcate knowledge of parser by parsing LL parser and LR parser 2. To demonstrate intermediate code using technique of syntax directed translation 3. To Illustrate the various optimization techniques for designing various optimizing compilers
Pre-Requisites	Knowledge of basic computer and mathematics.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Introduction to compilers – Analysis of the source, program, Phases of a compiler, Grouping of phases, compiler writing tools – bootstrapping, Lexical Analysis: The role of Lexical Analyzer, Input Buffering, Specification of Tokens using Regular Expressions, Review of Finite Automata, Recognition of Tokens.	**07 Hours**
Module-2	Syntax Analysis: Review of Context free Grammars – Derivation trees and parse trees, Ambiguity. Top-Down Parsing: Recursive Decent Parsing, Predictive parsing, LL(1) Grammars	**06 Hours**
Module-3	Bottom – Up Parsing:- Shift Reduce parsing- Operator precedence parsing (Concept Only) LR Parsing – Constructing SLR parsing tables, Constructing Canonical LR tables and Constructing LALR parsing tables	**06 Hours**
Module-4	Syntax directed translation: Syntax directed definitions, Bottom- up evaluation of S- attributed definitions, L- attributed definitions, Top- down translation, Bottom-up evaluation of inherited attributes. Type Checking: Type systems, Specification of a simple type checker.	**06 Hours**
Module-5	Run-Time Environments: Source Language issues, Storage organization, Storage- allocation strategies. Intermediate Code Generation (ICG): Intermediate languages – Graphical representations, Three-Address Code, Quadruples, Triples. Assignment statements, Boolean expressions.	**07 Hours**
Module-6	Code Optimization: Principal sources of optimization, Optimization of Basic blocks Code generation: Issues in the design of a code Generator. The target machine, A simple code generator.	**08 Hours**
Total		**40 Hours**

Text Books:	
1	Compilers–Principles, Techniques and Tools, A.V.Aho, M.S.Lam, R.Sethi, J.D.Ullman, Pearson, ISBN 0-201-10088-6
2	Compiler Design, K.Muneeswaran, OxfordUniversityPress, ISBN 10: 0198066643
Reference Books:	
1	Compiler Design, S.Chattopadhyay, PHI, ISBN-13 978-8120327252
2	Modern Compiler Design, D.Galles, Pearson Education, ISBN 8131709418
3	Advanced Compiler Design & Implementation, S.S. Muchnick, MORGAN KAUFMANN.
4	Compiler Design in C,A.I. Holub, PHI

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

CO.1	Define various phases of compiler, code optimization techniques and machine code generation.
CO.2	Classify top down & bottom-up parsing.
CO.3	Demonstrate DAG for intermediate code generation.
CO.4	Analyze the knowledge of parser by parsing LL parser and LR parser.
CO.5	Implementing code optimization by removing redundant and unreachable codes.
CO.6	Analyze & Design Run time environments and Syntax directed translations.

Type	Code	COMPUTER NETWORK	L-T-P	Credits	Marks
PC	**BTCS-T-PC-602**		3-0-0	3	200

Objectives	1. Build an understanding of the fundamental concepts of computer networking. 2. Familiarize the student with the basic taxonomy and terminology of the computer networking area. 3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking. 4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks
Pre-Requisites	Fundamental computer knowledge that includes concepts of computer architecture, Concept of Network and Graphs
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Module - #	Topics	Hours
Module - 1	**Introduction**: Uses of Computer Networks, Communication Types, Serial and Parallel Data Transmission; **Principles of Network Design:** Evolution of Computer, Networks, Topologies, Network Models (ISO-OSI, TCP/IP), Network Architecture.	**07 Hours**
Module - 2	**Physical Layer:** Transmission Medium: Guided Media, Unguided Media, Switching: Circuit Switching, Packet Switching, Message Switching; **Data Link Layer:** Framing; **Elementary Data Link Protocols:** Simplest Protocol, Stop and Wait Protocol; **Sliding Window Protocol**: Stop and Wait Automatic Repeat Request (ARQ); Go Back N-ARQ, Selective ARQ;	**07 Hours**
Module - 3	**Multiple Access Protocols:** Pure ALOHA, Slotted Aloha, CSMA, CSMA/CD,CSMA/CA; **Controlled Access Protocol:** Reservation, Pooling, Token passing; **Error Detection and Correction:** Standard Ethernet, MAC Sublayer	**07 Hours**
Module - 4	**Network Layer**: Network Layer Design issues; **Networks-routing algorithms:** optimality principle, shortest path, flooding, Distance Vector Routing, Link State Routing, Path Vector Routing, Hierarchical Routing; **IP addresses:** IPv4, IPv6; **Network devices:** Repeater, Hubs, Bridges, Switches, Routers, Gateways.	**07 Hours**
Module - 5	**Transport Layer**: Transport Service; Transport Layer Features; **Process to Process Delivery:** TCP, TCP Connection Establishment, 3-Way Handshaking, SYN Flooding Attack, Connection Termination, Flow Control and TCP Sliding Window, Nagel's Rule, TCP Congestion Control, UDP	**06 Hours**
Module - 6	**Application Layer**: DNS, Remote Logging, File transfer, Multimedia, Ziff's law, HTTP(S), SMTP, RPC, gRPC……	**06 Hours**
	Total	**40 Hours**

Text Books:	
1	Data Communications and Networking, Behrouz A. Forouzan, Tata McGraw-Hill ISBN-13 978-0070584082
2	Computer Networks, A.S. Tannenbum, Imprint of Pearson ISBN-13 978-9332518742
Reference Books:	
1	Computer Networks A System Approach, Larry L, Peterson ISBN-13: *978-0128182000*
2	Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
3	Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W.Ross, 3rd Edition, Pearson Education.

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

CO.1	To develop an understanding of modern network architectures from a design and performance perspective.
CO.2	Illustrate the conceptual design for Physical Layer and Transmission Media.
CO.3	Formulate the different Data Link Layer Protocols
CO.4	Understand and Apply Error Detection and Correction Methods of Data Link Layer.
CO.5	Summarize different Network Routing Algorithms
CO.6	Explain various Transport Layer Processes.

Type	Code	MACHINE LEARNING	L-T-P	Credits	Marks
PC	**BTCS-T-PC-603**		3-0-0	3	200

Objectives	1. To understand the basic theory underlying machine learning. 2. To be able to formulate machine learning problems corresponding to different applications. 3. To understand a range of machine learning algorithms along with their strengths and weaknesses
Pre-Requisites	Knowledge of mathematics and artificial intelligence basic concept.
Teaching Pedagogy	Formal face-to-face lectures Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material. Small periodic quizzes, to enable you to assess your understanding of the concepts.

Detailed Syllabus

Module-#	Topics	Hours
Module - 1	**Introduction:** Machine learning, Terminologies in machine learning, **Types of machine learning:** supervised, unsupervised, semi-supervised learning. Overview of supervised learning,	**05 Hours**
Module - 2	**Discriminative Models:** Least Square Regression, Gradient Descent Algorithm, Univariate and Multivariate Linear Regression, Multiple linear regression, Logistic regression	**05 Hours**
Module - 3	**Decision Trees:** Basic Terminology, Tree Construction , Splitting Criteria and Tree Pruning, Case Study of Classification Problem and regression problem Random Forests: Concept of Random Forests, Case Study of Classification Problem and regression problem using random forest	**08 Hours**
Module - 4	Generative model for discrete data (Bayesian concept learning, Naive Bayes classifier), **SVM for Classification- -** Large margin classifiers, Nonlinear SVM, SMO algorithm, kernel functions, Reproducing Kernels, SVM for regression, K-Nearest Neighbors (KNN)	**08 Hours**
Module - 5	**Unsupervised Learning:** K-Means Clustering, Hierarchical Clustering, Principal Component Analysis (PCA), Gaussian Mixture Models	**07 Hours**
Module - 6	**Model Evaluation and Tuning: Cross-Validation,** k-Fold Cross-Validation, **Hyperparameter Tuning,** Grid Search, Random Search, **Model Evaluation Metrics,** Confusion Matrix, ROC and AUC	**07 Hours**
Total		**40 Hours**

Text Books:	
1	E. Alpaydin, Introduction to Machine Learning, 2nd Edition, Prentice Hall of India, 2010, *ISBN*-13: 978-8120341609
2	An Introduction To Statistical Learning With Applications In Python, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor, Springer International Publishing, 2023, ISBN 3031387481
Reference Books:	
1	Y. G. James, D. Witten, T. Hastie, and R. Tibshirani, An Introduction to Statistical Learning with Applications in R, 2nd Edition, Springer, 2013, *ISBN*-13. 978-1461471370
2	T. M. Mitchell, Machine Learning, 1st Edition, McGrow-Hill Education, 2013, *ISBN*-13. 978-1259096952
3	C. M. Bishop, Pattern Recognition and Machine Learning, 1st Edition, Springer, 2006, *ISBN*-13. 978-1493938438

Digital Learning Resources:

1. https://nptel.ac.in/courses/106/106/106106139/: by Dr. B. Ravindran, IIT Madras
2. https://nptel.ac.in/courses/106/105/106105152/: by Prof. S. Sarkar, IIT Kharagpur

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

CO.1	To introduce concept of Machine Learning.
CO.2	To identify different machine learning algorithms.
CO.3	To determine most appropriate model in a specific context using model selection techniques.
CO.4	To implement the basic concepts of classification, regression, boosting methods.
CO.5	To learn the basic concepts of SVM algorithm, SVM for both classification and regression.
CO.6	To apply the machine learning algorithm to solve various real life problems.

Type	Code	GREEN TECHNOLOGY	L-T-P	Credits	Marks
OE	**BTCS-T-OE-601**		3-0-0	3	200

Objectives	1. Define global warming and explain its effects on India. 2. Illustrate global carbon control methods and compare power sources. 3. Assess green city measures; develop comprehensive green technology plan.
Pre-Requisites	Knowledge of basic concept of Science and Engineering.
Teaching Pedagogy	Formal face-to-face lectures Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material. Small periodic quizzes, to enable you to assess your understanding of the concepts.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Global warming and its effect Definition of global warming, Carbon Accumulation, Long Half-Life, Heating Potential, The Global Carbon Emission Situation and its effect in India, Kyoto and Other Protocols and its view in India,	**06 Hours**
Module-2	Climate change Effect of climate change and its impact. Steps taken to Control Carbon Emissions universally, Use of Promotional and Punitive Mechanisms for Reducing Carbon in Atmosphere, Developing Countrywide Adaptive Measures for Safety of Local People, Approach for Carbon Reduction, NAPCC, Green India Mission	**06 Hours**
Module-3	Control of Carbon Emissions: Technical approach Control of Carbon Emissions and Accumulation, Procedure to develop own Priorities and Business Opportunities in India for control of carbon emissions and accumulation, Needs a Mix of Green and Traditional Power Sources in India, A Logical Approach for Carbon Reduction, Need in India More Forests, Less Deforestation and payment rates procedure for controlling carbon emissions and its Promotional Mechanisms at India. Green Technologies for Energy Production:- Various Technologies Available for Energy Production, Cost Comparison of a Few Typical Systems for Power Generation, Sources of Energy Production Already in Use, Alternative Methods Ready for Use.	**03 Hours**
Module-4	Green Technologies for Personal and local Application Measures to be taken for Green city, Carbon Emission Reduction at Personal Level, Carbon Emission Reduction at Local Authority Level, Carbon Emissions from Imports. Promotion of 'Green' Buildings, Guidelines, The Energy Conservation Building Code (ECBC), Green Hotels and Hospitals,	**09 Hours**
Module-5	Green Technologies for Citywide Application Green Technologies for Transport, Green Roads, Ports and Harbours, Industries, Carbon, Carbon Emission Reduction at Citywide Level. Carbon Emissions from a Few Selected Industries in India, Area Re-Development Projects, 'Green'	**06 Hours**

	Infrastructure for Municipal Services, Bringing up Indian Villages, Green Services for Crematoria, Spreading Message to all Stakeholders.	
Module-6	High-tech Measures for Reducing Carbon Emissions Use of Solar Power with Satellite Based Systems, Use of Carbon Capture and Storage (Sequestration), Microorganisms, A Quick SWOT Analysis. National Action Plan to a Low Carbon Path, The Missions Help Develop Awareness, few case studies on Projects undertaken by Various Countries, Adaptive Measures Essential for Indian People to Cope with Climate Change.	**10 Hours**
Total		**40 Hours**

Text Books:	
1	Green Technologies Soli J. Arceivala McGraw Hill 2017
Reference Books:	
1	Green Technologies and Environmental Sustainability Ritu Singh, Sanjeev Kumar Springer 2017

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

CO1	Define global warming and identify key concepts such as carbon accumulation, long half-life, and heating potential.
CO2	Explain the global carbon emission situation and its specific effects on India, including the implications of international protocols like the Kyoto Protocal.
CO3	Illustrate steps taken universally to control carbon emissions, utilizing promotional and punitive mechanisms to reduce atmospheric carbon.
CO4	Compare green and traditional power sources in India, evaluating the benefits and challenges of each for effective carbon reduction.
CO5	Assess the effectiveness of measures for creating green cities and reducing carbon emissions at personal, local authority, and citywide levels.
CO6	Develop a comprehensive plan for promoting green technologies and infrastructure in India, including energy production, transport, and municipal services.

Type	Code	NPTEL	L-T-P	Credits	Marks
OO	**BTCS-T-OO-601**		0-0-0	2	100

Objectives	The objective is to facilitate the competitiveness of Indian industry in the global markets through improving the quality of engineering education by providing high quality learning material available to students by the Indian Institutes of Technology (IIT) and Technical Teacher Training Institutes (TTTI).
Pre-Requisites	Knowledge of basic skill in every subject
Teaching Pedagogy	Regular classroom lectures provided by different course providers online or virtual mode.

List of Courses provided:

To be notified by the head of the department before the commencement of Sixth semester.

Type	Code		L-T-P	Credits	Marks
SC	**BTCS-T-SC-601**	**ABILITY ENHANCEMENT TRAINING - E**	1-0-0	1	100

Objectives	1. Equip students with the necessary competencies, including communication, problem-solving, teamwork, and adaptability, to enhance their employability. 2. Offer training and education tailored to the needs and demands of various industries, ensuring that students gain relevant expertise. 3. Prepare students for the workforce by imparting practical knowledge, professional etiquette, and the ability to navigate the job market effectively.
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	Types of Machine Learning: Supervised, Unsupervised, and Reinforcement Learning, Real-world Applications of Machine Learning, Data and Features, Training, Validation, and Test Sets, Overfitting vs. Under fitting	**04 Hours**
Module-2	Mathematics for Machine Learning: Vectors, Matrices, and Operations**,** Basic Concepts of Probability and Statistics**,** Calculus: Derivatives and Gradients	**03 Hours**
Module-3	Simple Linear Regression, Multiple Linear Regression, K-Nearest Neighbors (KNN). Support Vector Machines (SVM)	**03 Hours**
Module-4	JDBC: JDBC introduction and jdbc connectivity, connectivity with MySQL connectivity with oracle, prepared Statement of curd operation.	**04 Hours**
Module-5	SERVLET: introduction of servlet and creating servlet and life cycle of servlet. Creating generic servlet and http servlet welcome file list and request dispatcher, set attribute and get attribute. JSP: introduction of jsp and their important tags, jsp all directives, error handling in jsp and redirect in jsp from one page to another page.	**03 Hours**
Module-6	HIBERNATE: introduction of hibernate and maven, hibernate using annotations @entity, @table and @i, hibernate using annotations @column, @generated Value and @temporal	**03 Hours**
Total		**20 Hours**

Text Book:	
1	E. Alpaydin, Introduction to Machine Learning, 2nd Edition, Prentice Hall of India, 2010, *ISBN*-13: 978-8120341609
2	Head First Java,Kathy Sierra and Bert Bates,O'REILLY,2nd Edition
Reference Books:	
1	T. M. Mitchell, Machine Learning, 1st Edition, McGrow-Hill Education, 2013, *ISBN*-13. 978-1259096952
2	Kanika Lakhani,Advance JAVA Programming, 1st Edition ,S.K. Kataria & Sons 2013, ISBN- 978-93-5014-455-8

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

CO.1	To formulate a machine learning problem.
CO.2	Select an appropriate pattern analysis tool for analyzing data in a given feature space.
CO.3	Apply pattern recognition and machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data..
CO.4	Understand the concepts related to Java Technology.
CO.5	Students learn to access database through Java programs, using Java Database Connectivity (JDBC).
CO.6	Create dynamic web pages, using Servlets and JSP& Develop advanced skills for programming

Type	Code	UNIVERSAL HUMAN VALUES	L-T-P	Credits	Marks
MC	**BTCS-T-MC-601**		2-0-0	0	100

Objectives	1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings. 2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way. 3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.
Pre-Requisites	To help students practiced and understand the various company pattern tests.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real-life problem-solving activities.

Detailed Syllabus

Module-#	Topics	Hours
Module-1	**Foundations of Value Education-A** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education); Understanding Value Education; Self-exploration as the Process for Value	**3 Hours**
Module-2	**Foundations of Value Education-B** Continuous Happiness and Prosperity - the Basic Human Aspiration; Happiness and Prosperity-Current Scenario; Method to Fulfill the Basic Human Aspirations.	**3 Hours**
Module -3	**Harmony in the Human Life, Relationships and Society-A** Understanding Human being as the Co-existence of the Self and the Body; Distinguishing between the Needs of the Self and the Body; Achieving Harmony: Integrating Self and the Body; Harmony in the Family and Society.	**4 Hours**
Module -4	**Harmony in the Human Life, Relationships and Society-**Trust'& 'Respect'– as Foundational Values in Relationship; Other Feelings, Justice in Human-to-Human Relationship; Understanding Harmony in the Society & Universal Human Order.	**3 Hours**
Module -5	**Harmony in the Nature/Existence & Professional Ethics-**A Understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature; Realizing Existence as Co-existence at All Levels .	**3 Hours**
Module -6	**Harmony in the Nature/Existence & Professional Ethics-**B The Holistic Perception of Harmony in Existence; Natural Acceptance of Human Values; Humanistic Education, Humanistic Constitution and Universal Human Order ; Competence in Professional Ethics – Ethical Decision Making&Transition towards Value-based Life and Profession.	**4 Hours**
Total		**20 Hours**

Text Book	
1	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004, ISBN 8122415660
Reference Books	
1	Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009, ISBN-13. 978-8174467652
2	Small is Beautiful - E. F Schumacher, *ISBN 13: 9780060803520*
3	B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008, *ISBN*-13. 978-8185936949

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

CO.1	To understand and analyses the foundations of value education, essentials of human values and skills, self-exploration, happiness and prosperity.
CO.2	Understand and analyze the foundations of value education, continuous happiness, and prosperity and basic human aspirations.
CO.3	Identify and evaluate the role of harmony in human life, relationship and harmony in family and society.
CO.4	Understand and associate the holistic perception of harmony at all levels such as existence of trust and respect, justice in human to human relationship.
CO.5	Develop appropriate technologies and management patterns to create harmony in professional and personal lives, harmony in the Nature/Existence such as understanding Harmony in the Nature; Interconnectedness, self-regulation and Mutual Fulfillment.
CO.6	Develop appropriate technologies and management patterns to create harmony in professional and personal lives like Natural Acceptance of Human Values.

Type	Code	COMPUTER NETWORK LAB	L-T-P	Credits	Marks
PC	**BTCS-P-PC-601**		0-0-2	1	100

Objectives	1. Build an understanding of the fundamental concepts of computer networking. 2. Familiarize the student with the basic taxonomy and terminology of the computer networking area. 3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
Pre-Requisites	Fundamental computer knowledge that includes concepts of computer architecture, Concept of Network and Graphs
Teaching Scheme	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with focus on real life problem solving activities.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Getting started with the basics of network configuration files and networking commands in Linux.	2 Hours
2	To familiarize and understand the use and functioning of system calls used for network programming in Linux.	2 Hours
3	Implement client-server communication using socket programming and TCP as transport layer protocol	2 Hours
4	Implement client-server communication using socket programming and UDP as transport layer protocol	2 Hours
5	Study of Network topology	2 Hours
6	Crimping Tool and use on Cat 6 Cable	2 Hours
7	Network topology demonstration using Cat 6 cables and Network devices.	2 Hours
8	Implementation of Stop and Wait Protocol and Sliding Window Protocol.	2 Hours
9	Implement congestion control using a leaky bucket algorithm.*	2 Hours
10	Study of Socket Programming and Client – Server model	2 Hours
11	Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS 2	2 Hours
12	Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer. i. Link State routing ii. Flooding iii. Distance vector	2 Hours

Text Books:
Computer Network Lab Manual, Department of CSE, GIFT, Bhubaneswar

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

CO.1	To familiarize students with the fundamentals of software testing.
CO.2	To enable students to apply software testing techniques in real-world scenarios.
CO.3	To develop students' skills in test planning, test case design, and test execution.
CO.4	To introduce students to automated testing tools and frameworks.
CO.5	To cultivate a mindset of quality assurance and continuous improvement in software development processes.
CO.6	To familiarize students with the fundamentals of software testing.

Type	Code	COMPILER DESIGN LAB	L-T-P	Credits	Marks
PC	**BTCS-P-PC-602**		0-0-2	1	100

Objectives	1. To inculcate knowledge of parser by parsing LL parser and LR parser 2. To demonstrate intermediate code using technique of syntax directed translation 3. 5. To Illustrate the various optimization techniques for designing various optimizing compilers
Pre-Requisites	Knowledge of basic computer and mathematics.
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Using JFLAP, create a DFA from a given regular expression. All types of error must be checked during the conversion.	2 Hours
2	i) Using JFLAP Create NFA from given Expression. ii) Convert NFA to DFA	2 Hours
3	Write C program to recognize strings under 'a' a*b+','abb'.	2 Hours
4	Write a C program to test whether a given identifiers valid or not.	2 Hours
5	i) Program to recognize a valid arithmetic expression that uses operator +, –, * and /. ii) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.	2 Hours
6	Implementation of Calculator using LEX and YACC.	2 Hours
7	Write program to find Simulate First and Follow of any given grammar	2 Hours
8	Construct a Shift Reduce Parser for a given language.	2 Hours
9	Develop an operator precedence parser for a given language	2 Hours
10	Write a program to perform loop unrolling.	2 Hours

Text Books:
Compiler Design Lab Manual, Department of CSE, GIFT, Bhubaneswar

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

CO1	Understand the working of lex and YACC compiler for debugging of programs.
CO2	Understand and define the role of lexical analyzer, use of regular expression and transition diagrams.
CO3	Understand and use Context free grammar, and parse tree construction.
CO4	Learn & use the new tools and technologies used for designing a compiler.
CO5	Develop program for solving parser problems.
CO6	Learn how to write programs that execute faster

Type	Code	MACHINE LEARNING LAB	L-T-P	Credits	Marks
PC	**BTCS-P-PC-603**		0-0-2	1	100

Objectives	1. To understand the basic theory underlying machine learning. 2. To be able to formulate machine learning problems corresponding to different applications. 3. To understand a range of machine learning algorithms along with their strengths and weaknesses. 4. To be able to apply machine learning algorithms to solve problems of moderate complexity
Pre-Requisites	Knowledge of mathematics and artificial intelligence basic concept.
Teaching Pedagogy	Formal face-to-face lectures Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material. Small periodic quizzes, to enable you to assess your understanding of the concepts.

Detailed Syllabus

Lab No:	Name of the experiments	Hours
1	Write a python program to import and export data using Pandas library functions.	2 Hours
2	Demonstrate various data pre-processing techniques for a given dataset	2 Hours
3	Implement Dimensionality reduction using Principle Component Analysis (PCA) method.	2 Hours
4	Write a Python program to demonstrate various Data Visualization Techniques.	2 Hours
5	Implement Simple and Multiple Linear Regression Models.	2 Hours
6	Develop Logistic Regression Model for a given dataset	2 Hours
7	Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.	2 Hours
8	Implement Naïve Bayes Classification in Python	2 Hours
9	Build KNN Classification model for a given dataset.	2 Hours
10	Build Artificial Neural Network model with back propagation on a given dataset.	2 Hours
11	a) Implement Random forest ensemble method on a given dataset. b) Implement Boosting ensemble method on a given dataset.	2 Hours
12	Write a python program to implement K-Means clustering Algorithm.	2 Hours

Text Books:
PYTHON Lab Manual, Department of CSE, GIFT, Bhubaneswar

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

CO.1	Understand the basic concept of Script language.
CO.2	Demonstrating the control statement in python
CO.3	Experiment on different datatypes in python.
CO.4	Ability to explore python especially the object-oriented concepts, and the built in objects of Python.
CO.5	Implementation of Python Modules.
CO.6	Ability to Create practical and contemporary applications on Machine learning.

Type	Code	PROJECT-IV	L-T-P	Credits	Marks
PS	**BTCS-P-PS-601**		0-0-4	2	100

Objectives	The objective is to analyze the designing process of combinational and sequential circuits, express arithmetic logic and shift micro-operations, identify the addressing modes used in macro instructions, apply algorithms for arithmetic operations and implementation for ALU design.
Pre-Requisites	Knowledge of Digital Electronics Circuits
Teaching Pedagogy	Regular classroom lectures with use of ICT as and when required, sessions are planned to be interactive with different examples

To be assign by Department.

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

CO.1	Identify Basic Organization of Computers.
CO.2	Identify the addressing modes used in macro instructions.
CO.3	Apply algorithms for arithmetic operations and implementation for ALU design.
CO.4	Develop micro code for typical instructions in symbolic form.
CO.5	Develop the pipeline and its performance.
CO.6	Identify Characteristics of Memory System.