# TULSIRAMJI GAIKWAD-PATIL
## College of Engineering & Technology
### Mohgaon, Wardha Road, Nagpur - 441 108

**A+ NAAC** (ACCREDITED WITH GRADE)
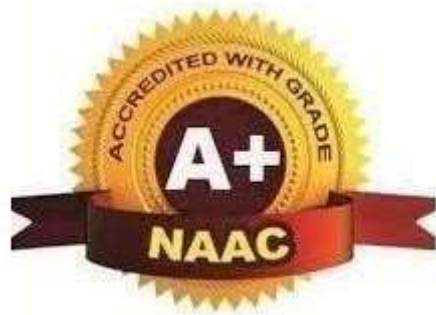
# Bachelor of Technology SoE and Syllabus 2025

**(Department of Science and Humanities)**

## Vision of Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

## Mission of Institute

M1- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.

M2- To provide facilities and services to meet the challenges of Industry and Society. M3- To facilitate socially responsive research, innovation and Entrepreneurship.

M4- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY
Wardha Road, Nagpur - 441108
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Approved by AICTE, New Delhi, Govt. of Maharashtra
(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)

### Department of Basic Sciences and Humanities

**Scheme of Instruction for First Year of B. Tech. (UG) Programme**
## Group-B Semester – I  (BT)

| SN | Sem | Type | BoS / Dept | Sub. Code | Subject | T/P | L | P | SL | Hrs | Credits | CT/IA | CA | ESE | TOTAL | ESE Duration Hours |
|----|-----|------|------|-----------|---------|-----|---|---|----|-----|---------|-------|----|----|-------|-------------------|
| | | | | | **FIRST SEMESTER (GROUP-B)** | | | | | | | | | | | |
| 1 | 1 | BSC | S&H | BSH41108 | Mathematical Foundation for Biotechnology | T | 4 | 0 | 2 | 6 | 4 | 30 | 10 | 60 | 100 | 3 |
| 2 | 1 | BSC | S&H | BSH41109 | Energy and Battery Technology | T | 3 | 0 | 2 | 5 | 3 | 30 | 10 | 60 | 100 | 3 |
| 3 | 1 | BSC | S&H | BSH41110 | Energy and Battery Technology Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 4 | 1 | ESC | BT | BBT41101 | Fundamentals of Biotechnology | T | 3 | 0 | 2 | 5 | 3 | 30 | 10 | 60 | 100 | 3 |
| 5 | 1 | IKS | S&H | BSH41204 | Indian Ancient Technology | T | 2 | 0 | 2 | 4 | 2 | 15 | 05 | 30 | 50 | 1 |
| 6 | 1 | ESC | ME | BME41101 | IDEA-Lab & Engineering  Workshop | P | 0 | 4 | - | 4 | 2 | 50 | - | - | 50 | - |
| 7 | 1 | ESC | CE | BCE41102 | Environment Sustainability -Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 8 | 1 | VSEC | CSE | BCS41104 | Fundamentals of Computer-Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 9 | 1 | VSEC | S&H | BSH41205 | Social Internship | P | 0 | 2 | - | 2 | 1 | 25 | - | - | 25 | - |
| 10 | 1 | PCC | BT | BBT41102 | Biotechnology Workshop-Lab | P | 0 | 4 | - | 4 | 2 | 25 | - | 25 | 50 | - |
| 11 | 1 | CC | S&H | BSH41X01 | Liberal Learning Module-I | P | 0 | 4 | - | 4 | 2 | 50 | - | - | 50 | - |
| | | | **TOTAL FIRST SEM** | | | | 12 | 20 | 08 | 40 | 22 | 330 | 35 | 310 | 675 | 10 |
| | | | | | **SECOND SEMESTER (GROUP-B)** | | | | | | | | | | | |
| 1 | 2 | BSC | S&H | BSH41209 | Applied Mathematics for Biotechnology | T | 4 | 0 | 2 | 6 | 4 | 30 | 10 | 60 | 100 | 3 |
| 2 | 2 | BSC | S&H | BSH41207 | Semiconductor Physics & Optics | T | 3 | 0 | 2 | 5 | 3 | 30 | 10 | 60 | 100 | 3 |
| 3 | 2 | BSC | S&H | BSH41208 | Semiconductor Physics & Optics -Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 4 | 2 | ESC | EE | BEE41201 | Principle of Electrical Engineering | T | 3 | 0 | 2 | 5 | 3 | 30 | 10 | 60 | 100 | 3 |
| 5 | 2 | ESC | EE | BEE41202 | Principle of Electrical Engineering -Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 6 | 2 | ESC | BT | BBT41201 | Cell Biology | T | 2 | 0 | 2 | 4 | 2 | 15 | 5 | 30 | 50 | 1 |
| 7 | 2 | ESC | IT | BIT41205 | 'C' Language -Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 8 | 2 | VSEC | BT | BBT41202 | Cell & Molecular Biology-Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | 25 | 50 | - |
| 9 | 2 | VSEC | S&H | BSH41105 | Professional Etiquette-Lab | P | 0 | 2 | - | 2 | 1 | 25 | - | - | 25 | - |
| 10 | 2 | AEC | S&H | BSH41104 | Digital Wellness & Basic Communication Lab | P | 0 | 4 | - | 4 | 2 | 50 | - | - | 50 | - |
| 11 | 2 | CC | S&H | BSH41Y01 | Liberal Learning Module-II | P | 0 | 4 | - | 4 | 2 | 50 | - | - | 50 | - |
| | | | **TOTAL SECOND SEM** | | | | 12 | 18 | 10 | 40 | 21 | 330 | 35 | 310 | 675 | 10 |

| Course  Category | BSC/ESC (Basic Science Course/ Engineering Science Course.) | PCC (Programme Core courses) | Multidisciplinary courses | VSEC (Skill Course) | Social Science & Management | | Experiential Learning Courses | CC (Co-Curricular Courses) |
|------------------|------|------|------|------|------|------|------|------|
| | | | | | AEC (Ability Enhancement Course) | IKS (Indian Knowledge System) | | |
| Credits SEM-I | 08 / 06 | -- | -- | 02 | 02 | -- | -- | 02 |
| Credits  SEM-II | 08 / 07 | 02 | -- | 02 | -- | 02 | | 02 |
| Cumulative  Sum | 16 / 13 | 02 | -- | 04 | 02 | 02 | -- | 04 |

**PROGRESSIVE TOTAL CREDITS: 22+21=43**

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | **July, 2025** | **4.00** | **Applicable for AY 2025-26 Onwards** |
| **Chairperson** | **Dean Academics** | **Vice Principal** | **Principal** | **Date of Release** | **Version** | |

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## Department of Basic Sciences and Humanities

**Scheme of Instruction for First Year of B. Tech. (UG) Programme**
**Group-B (BT)**

## Liberal Learning Modules for SEM-I

| SN | Sem | Type | BoS / Dept. | Sub. Code | Subject | T/P | Contact Hours | | | Credits | Weightage | | |
|----|-----|------|-------------|-----------|---------|-----|---|---|-----|---------|------------------|-----------|-------------------|
| | | | | | | | L | P | Hrs | | INT (1-Certificate) | ESE (MCQ) | External Practical |
| 1 | 1 | CC | S&H | BSH42Y01 | Art & Craft | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 2 | 1 | CC | S&H | BSH42Y02 | Poster & Video Design | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 3 | 1 | CC | S&H | BSH42Y03 | IPD (Integrated of Personality Development) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 4 | 1 | CC | S&H | BSH42Y04 | Sports (Outdoor & Indoor) | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 5 | 1 | CC | S&H | BSH41X05 | Yoga Practices & NSS | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 6 | 1 | CC | S&H | BSH41X06 | Interactive English (Level-1) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 7 | 1 | CC | S&H | BSH41X07 | Gateway to Competitive Exams (Level-1) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 8 | 1 | CC | S&H | BSH41X08 | Foreign Language -French (Level-1) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 9 | 1 | CC | S&H | BSH41X09 | Foreign Language –German (Level-1) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 10 | 1 | CC | S&H | BSH41X10 | Foreign Language –Japanese (Level-1) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |

## Liberal Learning Modules for SEM-II

| SN | Sem | Type | BoS / Dept. | Sub. Code | Subject | T/P | Contact Hours | | | Credits | Weightage | | |
|----|-----|------|-------------|-----------|---------|-----|---|---|-----|---------|------------------|-----------|-------------------|
| | | | | | | | L | P | Hrs | | INT (1-Certificate) | ESE (MCQ) | External Practical |
| 1 | 2 | CC | S&H | BSH42Y01 | Art & Craft | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 2 | 2 | CC | S&H | BSH42Y02 | Poster & Video Design | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 3 | 2 | CC | S&H | BSH42Y03 | IPD (Integrated of Personality Development) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 4 | 2 | CC | S&H | BSH42Y04 | Sports (Outdoor & Indoor) | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 5 | 2 | CC | S&H | BSH42Y05 | Indian Cuisine | P | 2 | 2 | 4 | 2 | 25 | - | 25 |
| 6 | 2 | CC | S&H | BSH42Y06 | Interactive English (Level-2) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 7 | 2 | CC | S&H | BSH42Y07 | Gateway to Competitive Exams (Level-2) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 8 | 2 | CC | S&H | BSH42Y08 | Foreign Language -French (Level-2) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 9 | 2 | CC | S&H | BSH42Y09 | Foreign Language –German (Level-2) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |
| 10 | 2 | CC | S&H | BSH42Y010 | Foreign Language –Japanese (Level-2) | P | 2 | 2 | 4 | 2 | 25 | 25 | - |

| Chairperson | Dean Academics | Vice Principal | Principal | July, 2025 | 4.00 | Applicable for AY 2025-26 Onwards |
|-------------|----------------|----------------|-----------|------------|------|-----------------------------------|
| | | | | Date of Release | Version | |

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## Department of Basic Sciences and Humanities

## Program: B. Tech First Year Group-B (BT)

**Semester-I** | **Mathematical Foundation for Biotechnology (BSH41108)**

| Teaching Scheme | | Examination Scheme (Th) | | Examination Scheme(P) | |
|---|---|---|---|---|---|
| **Theory (Th)** | 4 Hrs/week | **CT-I** | 15 Marks | - | - |
| **Practical (P)** | - | **CT-II** | 15 Marks | - | - |
| **Total Credits** | **4 (Th) = 4** | **CA** | 10 Marks | - | - |
| Duration of ESE:3Hrs | | **ESE** | 60 Marks | - | - |
| | | **Total Marks** | **100 Marks** | - | - |

**Pre-Requisites:** AICTE bridge course, Basics of Mathematics

**Course Objectives:**

| 1 | To identify algebraic problems from practical areas and obtain the solution in certain cases. |
|---|---|
| 2 | To expose students to understand the basic importance of Differential Calculus and Integral Calculus. |
| 3 | To understand different solution techniques of solving Beta and Gama Function and also understand solution of simultaneous equation by matrix method. |
| 4 | To apply your understanding of the concepts, formulas, and problem-solving procedures. |

| **Unit I** | **Trigonometry :** Basics of trigonometry, Relation between the polar co-ordinates and the cartesian co-ordinates, Solving a triangle, The sine rule, The cosine rule, The projection Rule, Application of the Sine rule, Cosine rule and Projection rule. |
|---|---|
| | **Activity 1: Graphical representation of basic Trigonometric functions using Scilab** <br> **Activity 2: Investigating Trigonometric ratios with real-life measurements.** |
| **Unit II** | **Differentiation**: <br> Derivatives of Composite function, derivatives of Inverse function, Logarithmic differentiation, derivatives of Implicit function, derivatives of parametric function, Higher order Derivatives Application of Derivatives (Rolle's theorem and LMVT, Maxima and Minima). |
| | **Activity 1: Computational evaluation of derivatives using Sagemath for symbolic and numeric differentiation.** |
| **Unit III** | **Integration :** Definition and Properties, Methods – Integration by Substitution, Integration by Parts, Integration by Partial Fraction, Definite Integration- Fundamental theorem of Integral calculus, reduction formulae |
| | **Activity 1: Calculate definite integrals within specified limits using SageMath.** <br> **Activity 2: Graphical visualization of integration using Scilab** |
| **Unit IV** | **Probability & Statistics: Probability**: Discrete Random Variable, Continuous Random Variable, Probability Distribution function, Probability density function, Binomial Distribution ,Uniform Distribution, Poisson's Theorem, Moment Generating Function. <br> **Statistics**: Mean, median, mode and standard deviation, Skewness & Kurtosis, Fitting of Curve-Straight line, Parabola, Exponential Curves, Correlation & Regression, Rank Correlation |
| | **Activity 1. Evaluate random variable by using Sagemath.** <br> **Activity 2. Determine mean, mode & median by sagemath.** <br> **Activity 3. Fit the straight line , Parabola and exponential curves by using Scilab** |
| **Unit V** | **Sequence & Series:** Sequence, types of sequence, test of convergence of sequences, Cauchy sequence, infinite series, power series, Alternating series, tests of convergence and absolute convergence of series. |
| | **Activity 1: Find the missing term based on logic or arithmetic rules** |

**Chairperson**

| Text Books | |
|---|---|
| T.1 | Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008). |
| T.2 | H.K.Das, Engineering Mathematics, S.Chand Publishers |
| T.3 | Outline Series, McGraw Hills, 4th Edition, 2016. |
| T.4 | P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi GrihaPrakashan. |
| T.5 | GB Thomas and R.L. Finney, Calculus and Analytic geometry $9^{th}$ edition, Pearson, Reprint2002. |
| Reference Books | |
| R.1 | Shanti Narayanan, Differential Calculus, S. Chand & Co., New Delhi, (2005). |
| R.2 | Shanti Narayanan, Integral Calculus, S. Chand & Co., New Delhi, (2005). |
| R.3 | John Bird, Basic Engineering Mathematics (5th ed.), Elsevier Ltd, (2010). |
| R.4 | Gilbert Strang: Linear Algebra and Its Applications (Paperback), Nelson Engineering (2007) |
| R.5 | A textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publication, Reprint 2010 |
| Useful Links | |
| 1 | https://archive.nptel.ac.in/courses/111/108/111108157/ |
| 2 | https://archive.nptel.ac.in/courses/111/104/111104144/ |
| 3 | https://archive.nptel.ac.in/courses/111/104/111104092/ |

| CO | Course Outcomes | CL | Class Sessions |
|---|---|---|---|
| CO1 | **Use** trigonometry to solve problems, understand functions, and apply it to real- life situations involving angles and patterns. | 3 | 9 |
| CO2 | **Find** the derivative of the given function and to find the maxima / minima of the given function. | 3 | 9 |
| CO3 | **Integrate** the given function by using the methods of integration and to find area under the given curve | 3 | 9 |
| CO4 | **Apply** probability and statistical methods to analyze real-world phenomena | 3 | 9 |
| CO5 | **Utilize** the concepts of sequences and series to address problems across mathematical and scientific domains | 3 | 9 |

**Chairperson**

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### Department of Basic Sciences and Humanities

## Program: B. Tech First Year Group-B (BT)

**Semester-I** — **Energy and Battery Technology:** BSH41109

| Teaching Scheme | | Examination Scheme(Th) | | Examination Scheme(P) | |
|---|---|---|---|---|---|
| Theory (Th) | 3 Hrs/week | CT-I | 15 Marks | - | - |
| Practical (P) | 2 Hrs/week | CT-II | 15 Marks | - | - |
| Total Credits | 3 (Th)+1 P)=4 | CA | 10 Marks | CA | 25 Marks |
| Duration of ESE:3Hrs | | ESE | 60 Marks | ESE | 25 Marks |
| | | Total Marks | 100 Marks | - | 50 Marks |

**Pre-Requisites:** AICTE Bridge Course, Energy sources, Electrochemistry, Water technology, Battery technology, polymers

**Course Objectives:**

| | |
|---|---|
| 1. | To gain the knowledge of Energy sources, types & Application. |
| 2. | To inculcate knowledge about Electrochemistry. |
| 3. | To enable to students to upgrade the existing knowledge of water technology. |
| 4. | To enlighten the students to the basic process of battery technology. |
| 5. | To gain the knowledge on synthesis, properties and applications of polymers. |

### Course Contents

| | |
|---|---|
| **Unit I** | **Energy Sources**: Introduction of energy, types of Energy(conventional and non-conventional energy sources), Introduction of fuels, classification and application, Calorific value determination of solid, liquid and Gas, Analysis of solid fuels, Fractional distillation, CNG and Bio-Diesel. |
| | **Class activity**: Creative poster making on any one **non-conventional energy source.** |
| **Unit II** | **Electrochemistry**: Basics of Electrochemistry, Conductors and Insulators, Specific Conductance, Molar Conductance, Equivalent Conductance, Laws of Electrochemistry, Concept of Galvanic Series, Electrode potential, Standard electrode potential, Cell potential and EMF of a cell, Nernst equation and its application, Electroplating Process: Principle, Factors Influencing Electroplating and their applications, Numerical. |
| | **Class activity**: MCQ based quiz base on basics of Electrochemistry. |
| **Unit III** | **Water pollution and Softening processes**: Introduction, Sources of pollution, Hardness Coagulation, Sterilization, Softening process (Zeolite process and Ion Exchange Process) Boiler trouble due to scale and sludge, Desalination of water by Reverse osmosis. |
| | **Class activity**: Crossword Puzzle on the basis of softening process of water. |
| **Unit IV** | **Battery Technology**: Introduction of batteries, Primary and secondary batteries, Types of Batteries with construction, working and their applications (Carbon-Zn, Alkaline Zinc, Ni-Cd, Lead Acid battery, Lithium ion battery) $H_2$-$O_2$ Fuel cell, Methanol Fuel Cell and its applications, Differences between Battery and Fuel cell, Recycling and safe disposal of batteries. |
| | **Class activity**: Pattern based quiz on application of battery |
| **Unit V** | **Polymer Science**: Introduction, Classification of Polymers, Uses of commercially important polymers with synthesis, properties and applications, Polyethylene, PVC, Teflon, Terylene, Conducting & Insulating Polymers, polyaniline, polypyrrole and polylactic acid. |
| | **Class activity**: Prepare the chart of types of polymer with their monomers, properties and application. |

**Chairperson**

| Text Books | |
|---|---|
| T.1 | Engineering Chemistry by S.S. Dara, 10th Edition. S. Chand & Co |
| T.2 | Engineering Chemistry Dr. Avinash Bharti, V.K. Walekar, 1st Edition. Tech Max. |
| T.3 | Textbook of Engineering Chemistry: P.C Jain& Monica Jain, 15thEdition.Dhanpatrai publication Ltd |

| Reference Books | |
|---|---|
| R.1 | Applied Chemistry: Narkhede & Bhake, 1st Edition. Das Ganu Prakashan. |
| R.2 | Engineering Chemistry Dr. Avinash Bharti, V.K. Walekar, 1st Edition. Tech Max |

| Useful Links | |
|---|---|
| 1 | https://nptel.ac.in/courses/103/103/103103206/ |
| 2 | https://nptel.ac.in/courses/103/108/103108162/ |
| 3 | https://nptel.ac.in/courses/104/105/104105124/ |

## LIST OF EXPERIMENTS  (Energy and Battery Technology: BSH41110)

| | | |
|---|---|---|
| 1 | Determination of Moisture Content or Volatile Matter & Ash Content of Coal sample. | CO1 |
| 2 | Determination of Flash Point of given Oil by Pensky Martine or Abel's Apparatus | CO1 |
| 3 | Determination of pH of given Solution. | CO2 |
| 4 | Determination of Electrode Potential by Galvanic Cell | CO2 |
| 5 | Determination of Hardness of Water Sample by Complexometric Method. | CO3 |
| 6 | Determination of Calcium Ion & Magnesium Ion Separately. | CO3 |
| 7 | Determination of Current by using salt water battery. | CO4 |
| 8 | Estimation of amount of zinc liberated during electrolysis. | CO4 |
| 9 | Determination of Saponification value of Bio-Degradable Polymer. | CO5 |
| 10 | Synthesis of Conducting Polymer. (Poly Aniline) | CO5 |

| Text Books | |
|---|---|
| T.1 | Experiments and Calculations in Engineering Chemistry by S. Chand |
| T.2 | Practical Engineering Chemistry: By S.N. Narkhede, Dr. R.T. Jadhav, Dr. A.B. Bhake |

| Reference Books | |
|---|---|
| R.1 | A textbook on experiment and calculation By S.S. Dara |
| R.2 | Inorganic Quantitative analysis, Vogel |

| Useful Links | |
|---|---|
| 1 | https://nptel.ac.in/courses/108/104/10810412345/ |
| 2 | http://nptel.ac.in/courses/1171012546/ |

| CO | Course Outcomes | CL | Class Sessions |
|---|---|---|---|
| CO1 | **Understand** the types of Energy sources and its properties and application | 2 | 9 |
| CO2 | **Illustrate** different laws of Electrochemistry. | 2 | 9 |
| CO3 | **Differentiate** water pollution and its softening process. | 2 | 9 |
| CO4 | **Interpret** different types and applications of batteries. | 3 | 9 |
| CO5 | **Predict** the types and applications of commercial polymers. | 3 | 9 |

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**Department of Basic Sciences and Humanities**

## Program: B. Tech First Year Group-B (BT)

**Semester-I :** | **Fundamentals of Biotechnology (BBT41101)**

| Teaching Scheme | | Examination Scheme(Th) | | Examination Scheme(P) | |
|---|---|---|---|---|---|
| Theory (Th) | 3 Hrs/week | CT-I | 15 Marks | - | - |
| Practical (P) | 2 Hrs/week | CT-II | 15 Marks | - | - |
| Total Credits | 3 (Th) | CA | 10 Marks | - | - |
| Duration of ESE: 3 Hrs | | ESE | 60 Marks | - | - |
| | | Total Marks | 100 Marks | - | - |

### Course Objective:

| | |
|---|---|
| 1 | To explore the various branches of biotechnology, including plant, animal, marine, agriculture, healthcare, industrial, pharmaceutical, and environmental biotechnology. |
| 2 | To understand the principles and applications of biotechnology in environmental management, biodegradation, bioremediation and Bio mining. |
| 3 | To analyze the role of enzymes used in textile industry, breweries and food supplements. |
| 4 | To obtain the biotechnological applications in food processing. |
| 5 | To evaluate the applications of biotechnology in human health and livestock improvement. |

### Course Contents

| | |
|---|---|
| Unit 1 | **Scope and Introduction to Biotechnology:** Introduction to Biotechnology, Definition of Biotechnology. Traditional and Modern Biotechnology. Overview of Branches of Biotechnology: Plant, Animal Biotechnology, Marine Biotechnology, Agriculture, Healthcare, Industrial Biotechnology, Pharmaceutical Biotechnology and Environmental Biotechnology. |
| Unit 2 | **Environment:** Applications of Biotechnology in environment aspects: waste management, biodegradation of heavy metals, removing oil spills, air and soil pollution, bioremediation, bio mining. |
| Unit 3 | **Industry**: Enzymes for textile industry, breweries and food supplements, single cell protein, vitamins, food processing cheese, yoghurt making. |
| Unit 4 | **Food Biotechnology** : Overview of Biotechnological applications in enhancement of Food Quality, Quality Factors in Preprocessed Food, Microbial role in food products (Yeast and Bacterial based process and products). |
| Unit 5 | **Human Health and livestock:** Applications in Human Health: Antibiotic production, Molecular diagnostics, vaccines and vaccine delivery, recombinant therapeutics, gene therapy, forensics.<br>Applications in livestock improvement: transgenic animals, Increased milk production, artificial insemination, Invitro fertilization. |

### Text Books

| | |
|---|---|
| 1 | Crueger Wand Crueger, A. 2000. Biotechnology: A textbook of Industrial Microbiology. 2$^{nd}$ edition. Panima Publishing Co. New Delhi. |
| 2 | Eckert, W.G. and Wrightin, R.K. 1997. Introduction to Forensic Sciences. 2$^{nd}$ Edition, CRC Press. |
| 3 | McGregor, C.W.; Membrane separation in Biotechnology; Marcel Dekker, Inc, New York. |

**Chairperson**

| | Reference Books |
|---|---|
| 1 | Hans-Joachim Jordening and Jeset Winter, 200s. Environmental Biotechnology Concepts and Applications |
| 2 | Microbiology: Michael J. Pelczar Jr., E. C. S Chan, Noel R. Krieg |
| 3 | Patel, A.H.1996.Industrial Microbiology.1$^{st}$ edition, Macmillian India limited |

**Useful Links**

| | |
|---|---|
| 1 | https://nptel.ac.in/courses/102103045 |
| 2 | https://sist.sathyabama.ac.in/sist_coursematerial/uploads/SBTA1304.pdf |
| 3 | https://onlinecourses.nptel.ac.in/noc21_bt41/preview |

| CO | Course Outcomes | CL | Class Session |
|---|---|---|---|
| CO1 | **Explain** the significance of various branches of biotechnology. | 2 | 9 |
| CO2 | **Explore** the knowledge about environmental aspects and role of enzymes in the Biotechnology. | 2 | 9 |
| CO3 | **Competent** to apply the knowledge gained in fermentation technology. | 3 | 9 |
| CO4 | **Compare** the knowledge gained in food processing. | 4 | 9 |
| CO5 | **Analyze** the basic Biotechnology knowledge in Human Health and livestock improvement. | 4 | 9 |

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**Department of Basic Sciences and Humanities**

## Program: B. Tech First Year Group-B (BT)

| Semester-I | Indian Ancient Technology: BSH41204 | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme (Th)** | | **Examination Scheme (P)** | |
| **Theory (Th)** | 2Hrs/week | **CT-I** | 7 Marks | - | - |
| Practical(P) | - | **CT-II** | 7 Marks | - | - |
| **Total Credits** | **2 (Th)** | **CA** | 6 Marks | - | - |
| Duration of ESE: 2Hrs | | **ESE** | 30 Marks | - | - |
| | | **Total Marks** | **50 Marks** | - | - |

**Pre-Requisites:**

**Course Objectives:**

| 1. | To understand the foundational concepts and key developments in ancient Indian technology. |
|---|---|
| 2. | To summarize ancient Indian innovations in metallurgy, architecture, agriculture, and medicine. |
| 3. | To paraphrase the ecological and societal impact of these technologies and their relevance today. |

### Course Contents

| Unit-I | **Foundations of Indian Ancient Technology -** Definition and scope, Sources: archaeological, literary (Vedas, epics, treatises), Chronological overview (Indus Valley to Gupta period and beyond) |
|---|---|
| | **Activity 1:** Group presentation on selected ancient technology or scientist. **Activity 2:** Quiz format with speed challenges. |
| Unit-II | **Technological Innovations & Metallurgy:** Wootz steel and its global influence, Iron Pillar of Delhi and corrosion resistance, Zinc smelting at Zawar mines, Bronze and copper tools in the Harappan civilization. |
| | **Activity 1:** Poster creation on sustainability in ancient Indian technology. **Activity 2:** Group discussion on Why did the Iron Pillar resist rust for over 1600 years? |
| Unit-III | **Science, Medicine & Sustainability –**Astronomy and ancient scientific instruments, Ayurveda and ancient surgical techniques, Ecological practices and sustainable technology, Revival and modern applications of ancient technology. |
| | **Activity 1:** Discussion on integrating traditional technologies in modern practices. **Activity 2:** Prepare a chart of Tridosha (Vata, Pitta, Kapha) and match herbs to body types. |

**Text Books :-**

| T.1 | Aspects of Science and Technology in Ancient India Edited by Arun Kumar Jha and Seema Sahay |
|---|---|
| T.2 | The Ancient Engineers by L. Sprague de Camp |
| T.3 | The Golden Road: How Ancient India Transformed the World by William Dalrymple |

**Reference Books:-**

| R.1 | "The Wonder That Was India" – A. L. Basham |
|---|---|
| R.2 | "Iron and Steel in Ancient India" – B. R. Pant |
| R.3 | "Indian Medicine in the Classical Age" - P. Kutumbiah |

**Chairperson**

| Course Code | Course Outcomes | CL | Class Sessions |
|---|---|---|---|
| **CO1** | **State** major ancient Indian technologies and their principles. | 1 | 9 |
| **CO2** | **Describe** the processes and applications of metallurgy, architecture, and agriculture in ancient India. | 1 | 8 |
| **CO3** | **Explain** the sustainability and modern relevance of ancient Indian technologies. | 2 | 8 |

**Chairperson**

# TULSIRAMJI GAIKWAD-PATIL COLLEGE OF ENGINEERING & TECHNOLOGY

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## Department of Basic Sciences and Humanities

## Program: B. Tech First Year Group-B (BT)

**Semester-I**  **IDEA-Lab & Engineering Workshop: BME41101**

| Teaching Scheme | | Examination Scheme(Th) | | Examination Scheme(P) | |
|---|---|---|---|---|---|
| **Theory (Th)** | - | **CT-I** | - | - | - |
| Practical (P) | 2 Hrs/week | **CT-II** | - | - | - |
| **Total Credits** | **2 (P) = 1** | **CA** | - | **CA** | 25 Marks |
| - | | **ESE** | **-** | **ESE** | 25 Marks |
| | | **Total Marks** | **-** | **-** | **50 Marks** |

### Course Objectives:

| 1. | To develop skills in using fitting tools for precise operations like chipping, filing, drilling, and tapping to produce accurate mechanical joints. |
|---|---|
| 2. | To use carpentry tools for constructing basic wood joints and understand traditional and modern wood turning methods. |
| 3. | To practice edge preparation and perform basic arc welding techniques for creating strong metal joints. |
| 4. | To understand various welding processes and joint types through hands-on experience with welding simulation software. |
| 5. | To identify types of fasteners and demonstrate threading operations and measurement techniques. |

### List of Experiment

| 1 | **Fitting:** Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling and tapping.<br>**Job-1:** Fitting to size, male-female fitting with drilling and tapping. | CO1 |
|---|---|---|
| 2 | **Carpentry**: Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods.<br>**Job-2:** L Joint / T Joint / Cross joint | CO2 |
| 3 | **Welding:** Use and setting of tools and equipment for edge preparation for welding jobs and Arc welding for different job.<br>**Job-3:** Lap welding of two plates / butt welding of plates. | CO3 |
| 4 | **Welding Simulation:** introduction to welding, types of welding process, types of joints, materials, application of different types of welding.<br>**Job-4:** Job on Simulation Package Software | CO4 |
| 5 | **Fasteners:** Types of fastening process, Screw threads, nut & bolt. Demonstration of thread forming/machining and its measurement. | CO5 |

### Text Books

| T.1 | "Elements of Workshop Technology":Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai. |
|---|---|
| T.2 | "Manufacturing Technology – I":Gowri P., Hariharan and A. Suresh Babu, Pearson Education, 2008. |

### Reference Books

| R.1 | "Process and Materials of Manufacture": Roy A. and Lindberg, 4th Edition, Prentice Hall India 1998. |
|---|---|
| R.2 | "Elements of Workshop Technology": S K Hajra, Choudhury, A K Hajra, Choudhury, &Nirjhar Roy, Vol. I &II. |
| R.3 | "A Course in Workshop Technology":B S Raghuwanshi, Vol. 1 & II. |

**Chairperson**

| CO | Course Outcomes | CL | Class Session |
|---|---|---|---|
| **CO1** | **Identify** marking tools, hand tools, measuring instruments and to work to prescribed dimensions/tolerances on mating of two metal parts. | 1 | 4 |
| **CO2** | **Understand** carpentry tools for wooden joints, Simple exercise using jack plane. | 2 | 4 |
| **CO3** | **Apply** the joint by Arc welding, Simple butt and Lap welded joints. | 3 | 4 |
| **CO4** | **Demonstrate** advance welding process on simulation package to obtain practical skills in the various trades. | 3 | 4 |
| **CO5** | **Differentiate** types of fasteners and **evaluate** their suitability for specific mechanical or structural uses. | 4 | 4 |

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### Department of Basic Sciences and Humanities

## Program: B. Tech First Year(BT)

| Semester-I | Environment Sustainability-Lab: BCE41102 | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme (Th)** | | **Examination Scheme (P)** | |
| Theory (Th) | - | - | - | - | - |
| **Practical (P)** | 2 Hrs./week | - | - | - | - |
| **Total Credits** | 1 | - | - | IA | 25 Marks |
| - | | - | - | ESE | 25 Marks |
| | | - | - | Total | **50 Marks** |

**Pre-Requisites: NA**

**Course Objectives:**

| 1. | Develop skills to assess and manage water resources sustainably. |
|---|---|
| 2. | Apply techniques to control soil erosion and waste recycling. |
| 3. | Analyze environmental impacts of air and energy systems. |
| 4. | Design sustainable infrastructure using permeable materials and green roofs. |
| 5. | Evaluate carbon footprints and promote eco-friendly civil engineering practices. |

### Course Contents

| Sr. No. | Name of Experiment | CO mapped |
|---|---|---|
| 1. | Assess the quality of water samples from different sources | CO-1 |
| 2. | Construct and evaluate a small-scale rainwater harvesting system | CO-1 |
| 3. | Study soil erosion and evaluate control measures | CO-2 |
| 4. | Demonstrate the composting process for organic waste | CO-2 |
| 5. | Measure air pollution levels in different locations | CO-3 |
| 6. | Assess energy consumption in a classroom | CO-3 |
| 7. | Evaluate water infiltration in permeable pavements | CO-4 |
| 8. | Assess the recyclability of construction waste | CO-4 |
| 9. | Estimate personal carbon footprints | CO-5 |
| 10. | Evaluate the benefits of green roofs | CO-5 |

**Text Books**

| T.1 | Peavy, H. S., Rowe, D. R., & Tchobanoglous, G. (2017). Environmental Engineering, McGraw-Hill Education |
|---|---|
| T.2 | Davis, M. L., & Cornwell, D. A. (2014). Introduction to Environmental Engineering (5th ed.), McGraw-Hill Education |
| T.3 | Masters, G. M., & Ela, W. P. (2014). Introduction to Environmental Engineering and Science (3rd ed.), Pearson |
| T.4 | Sharma, H. D., & Reddy, K. R. (2004). Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies, Wiley |
| T.5 | Newman, J., & Choo, B. S. (2003). Advanced Concrete Technology: Constituent Materials, Elsevier |

**Reference Books**

| R.1 | Sachs, J. D., & Ban, K. (2015). The Age of Sustainable Development. Columbia University Press |
|---|---|
| R.2 | Kubba, S. (2010). LEED Practices, Certification, and Accreditation Handbook. Elsevier |
| R.3 | Rittmann, B. E., & McCarty, P. L. (2001). Environmental Biotechnology: Principles and Applications. McGraw-Hill |
| R.4 | LaGrega, M. D., Buckingham, P. L., & Evans, J. C. (1994). Hazardous Waste Management. McGraw-Hill |
| R.5 | Thibodeaux, L. J. (1996). Environmental Chemodynamics: Movement of Chemicals in Air, Water, and Soil (2nd ed.). Wiley Interscience. |

**Chairperson**

| BCE41102 | Course Outcomes | | CL | Lab Session |
|---|---|---|---|---|
| CO1 | **Apply** methods to assess water quality and design rainwater harvesting systems. | | 2 | 4 |
| CO2 | **Implement** erosion control and manage organic waste sustainably. | | 2 | 4 |
| CO3 | **Evaluate** air quality data and develop strategies to optimize classroom energy use. | | 3 | 4 |
| CO4 | **Assess** permeable pavements and formulate plans for recycling construction waste. | | 3 | 4 |
| CO5 | **Analyze** carbon footprints and design green roof models for environmental benefits. | | 3 | 4 |

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**Department of Basic Sciences and Humanities**

## Program: B. Tech First Year Group-B (BT)

| Semester-I | Fundamentals of Computer-Lab: BCS41104 | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme (Th)** | | **Examination Scheme (P)** | |
| **Theory (Th)** | - | **CT-I** | - | - | - |
| Practical (P) | 4 Hrs/week | **CT-II** | - | - | - |
| **Total Credits** | **2(P)** | **CA** | - | - | 25 Marks |
| Duration of ESE: 2Hrs | | **ESE** | - | - | 25 Marks |
| | | **Total Marks** | **-** | **-** | **50 Marks** |

**Pre-Requisites:**

**Course Objectives:**

| 1. | To understand the foundational concepts and key developments in ancient Indian technology. |
|---|---|
| 2. | To summarize ancient Indian innovations in metallurgy, architecture, agriculture, and medicine. |
| 3. | To paraphrase the ecological and societal impact of these technologies and their relevance today. |

| **Course Contents** | |
|---|---|
| **Unit-I** | **Introduction to Computer:** - Characteristics of Computers, Basic Applications of Computer, Classifications of Computers: Representation of data/Information concepts of data processing, Definition of Information and data, Basic data types Storage of data/Information as files<br>**Components of Computer System:** Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software |
| **Unit-II** | **Introduction to Operating System:** - Overview of Operating System, Booting Process of Operating System, Functions or Tasks of the Operating System, I/O Management, Data Management, Memory Management, Device Management<br>**PC Troubleshooting, Maintenance and Tools: -** Preventive Maintenance: Active, Passive, periodic maintenance procedure, Preventive maintenance of peripherals of PCs. Fault finding and troubleshooting of the above peripherals, Diagnostic software |
| **Unit-III** | **Introduction of TCP/IP: -** Characteristics of TCP/IP, TCP/IP Layers, Application/Uses of TCP/IP, Introduction of LAN, WAN and MAN Microsoft Office Installation and Document Formatting:- Microsoft Office Installation, Introduction to Microsoft Word/Excel/Power Point Presentation, Document Formatting and Styling, Advanced Word Features |

**Text Books :-**

| T.1 | Fundamentals of Computers, V. Rajaraman, PHI Learning Pvt. Ltd., 6th Edition. |
|---|---|
| T.2 | Computer Fundamentals, P.K. Sinha & Priti Sinha, BPB Publication, 6th Revised Edition |

**Reference Books:-**

| R.1 | Introduction to Computers, Peter Norton, McGraw-Hill Education, 7th Edition. |
|---|---|
| R.2 | Computer fundamentals, Anita Goel, Pearson Education, 1st Edition. |
| R.3 | Information Technology: Principles and Applications, A.K. Sharma, University Science Press(Laxmi publications), Latest Edition |

**Useful Links:-**

| 1. | https://youtu.be/eEo_aacpwCw |
|---|---|
| 2. | https://youtu.be/dOiA2nNJpc0 |
| 3. | https://youtu.be/gxsFmFU4al0 |

**Chairperson**

| Sr. No. | List of Experiment | |
|---|---|---|
| 1 | To identify the computer hardware parts Procedure. | CO1 |
| 2 | Assembling and disassembling the system hardware components of the personal computer Requirements:<br>1. CPU (Processor)      2. Mother Board      3. Floppy Disk Drive Monitor<br> 4. Cabinet              5. Speaker           6. Key Board<br> 7. Mouse             8. Bus Cables      9. RAM (SD or DDR)<br>10. Hard Disk Drive    11. Power         12. SMPS<br>13. Monitor          14. Screw        15. Printer<br>16. CD or DVD ROM Cables Driver | CO1 |
| 3 | The installation steps for the Windows operating system. Requirement:<br>1. Operating System CD                     2. Computer | CO1 |
| 4 | The installation steps for the Linux operating system. Requirement:<br>1. Operating System CD                     2. Computer | CO2 |
| 5 | To facilitate a software troubleshooting exercise, students will be provided with a malfunctioning CPU afflicted by system software issues. Their task will be to diagnose and resolve the problem to restore the computer to working condition. | CO2 |
| 6 | To learn about Local Area Networks and Internet access, students will configure the TCP/IP settings. In the final step, students should demonstrate to the instructor how to access websites and email | CO2 |
| 7 | To learn about various internet threats and configure their computer to be secure while online. | CO2 |
| 8 | Installation MS Office Apply different alignments, correct formats in MS-Word, Excel and Power Point Presentation. | CO3 |
| 9 | Create a Visiting Card of your college using page size as follows<br>• Page width="3.2"         • Page height="2"<br>And use different font styles, sizes, alignments, and apply printed water mark on the paper. | CO3 |
| 10 | Create a mail merge to call 10 members for an interview. | CO3 |

| CO | Course Outcomes | CL | Class Session |
|---|---|---|---|
| CO1 | **Understand** and explain the basic structure, components, and functioning of a computer system. | 2 | 4 |
| CO2 | **Demonstrate** knowledge of operating system functions, data storage, and perform basic troubleshooting and maintenance of PCs. | 3 | 4 |
| CO3 | **Apply** the uses of Microsoft Office tools (Word, Excel, PowerPoint) for document creation, formatting, and presentation. | 3 | 4 |

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**Department of Basic Sciences and Humanities**

## Program: B. Tech First Year Group-B (BT)

**Semester-I**   **Social Internship (BSH41205)**

| Teaching Scheme | | Examination Scheme (Th) | | Examination Scheme(P) | |
|---|---|---|---|---|---|
| **Practical (P)** | - | **Internal** | 50 Marks | - | - |
| - | - | - | - | - | - |
| **Total Credits** | **1(Pr) = 2** | - | - | - | - |
| Duration of ESE:2Hrs | | **Report Submission** | 50 Marks | - | - |
| | | **Total Marks** | **50 Marks** | - | - |

**Pre-Requisites: NA**

**Course Objectives:**

| 1. | To develop a sense of responsibility and empathy toward community welfare and social issues. |
|---|---|
| 2. | To motivate students to contribute time, skills, and effort to NGOs, rural development programs. |
| 3. | To align student efforts with national development goals like health, education, environment. |

### Course Contents

| Unit I | **Introduction of Social Responsibility and community Collaboration:** Introduction, Types and Understanding of Social Responsibility. Understand community and diversity and introduction and types of social issues and its challenges to overcome. |
|---|---|
| | **Activity**: **Draw the chart of Various Social issues in Daily life** |
| Unit II | **Introduction of Social Organization and initiatives:** Introduction of Social Organization and its Types, Introduction of social program and scheme, role and responsibility of volunteers and intern. Essential Skil for social engagement, Social Organization collaboration and confirmation. |
| | **Activity**: **Identification and planning for Internship with organization.** |
| Unit III | **Practical Implementation & reflection of Social Internship:** Process and Observation of Internship, Report and Workbook writing on basis of routine activity and reflection of learning, submission of detail report on Social internship along with outcome. |
| | **Activity**: **Submission of Detail Internship Report and its Outcome.** |

**Text Books**

| T.1 | Social Welfare Administration in India, Sachdeva D.R. Kitab Mahal 2nd Edition. |
|---|---|
| T.2 | *Social Problems in India,* Ram Ahuja, Rawat Publications 3rd Edition. |

**Reference Books**

| R.1 | Contemporary Social Problems in India, G.R. Madan, Allied Publishers |
|---|---|
| R.2 | Fieldwork Training in Social Work, Sanjoy Roy, Rawat Publications |

**Useful Links**

| 1 | https://www.youtube.com/watch?v=Xz_TLJmatGc |
|---|---|
| 2 | https://www.youtube.com/watch?v=Xz_TLJmatGc |

| CO | Course Outcome | CL | Lab Sessions |
|---|---|---|---|
| CO1 | **Understand** the concept of Social Responsibility and Community Collaboration. | 2 | 4 |
| CO2 | **Implement** and document the Social Internship process. | 3 | 4 |
| CO3 | **Apply** essential skills for social engagement and internship planning. | 3 | 4 |

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### Department of Basic Sciences and Humanities

## Program: B. Tech First Year Group-B (BT)

| Semester-I | **Biotechnology Workshop-Lab (BBT41102)** | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme (Th)** | | **Examination Scheme** | |
| **Theory (Th)** | - | **CT-1** | - | - | - |
| **Practical (P)** | 4 Hrs/week | **CT-2** | - | - | - |
| **Total Credit** | 2(P) | **CA** | - | **CA** | 25 Marks |
| Duration of ESE:03Hrs 00Min. | | **ESE** | - | **ESE** | 25 Marks |
| | | **Total Marks** | - | - | 50 Marks |

**Pre-Requisites**:-NA

**Course Objective:**

| 1 | To familiarize students with laboratory safety protocols, equipment handling, and good lab practices in biotechnology |
|---|---|
| 2 | To train students in basic experimental techniques including solution preparation, sterilization, and microscopy. |
| 3 | To introduce students to fundamental biochemical methods for analyzing biomolecules and performing basic lab experiments. |

| | List of Experiments | CO |
|---|---|---|
| **1** | Introduction to Laboratory Safety and Good Lab Practices (GLP) | CO1 |
| **2** | Cleaning, Sterilization of Glassware and Work Area Using Autoclave | CO2 |
| **3** | Operation and Calibration of pH Meter | CO3 |
| **4** | Demonstration of Microscopy: Fixing and Focusing of Slides | CO3 |
| **5** | Preparation of Buffers and pH Measurement | CO4 |
| **6** | Preparation of Solutions with Known Molarity and Normality | CO4 |
| **7** | DNA Extraction from Plant Material | CO5 |
| **8** | Quantification of DNA using UV Spectrophotometry | CO5 |
| **9** | Blood group detection using Slide Agglutination | CO5 |
| **10** | Protein precipitation using ammonium sulfate method | CO5 |

**Text Books**

| 1 | Anju Dahiya, *Bioenergy: Biomass to Biofuels and Waste to Energy*, 2nd Edition, Academic Press, 2020 |
|---|---|
| 2 | John E. Smith, *Biotechnology*, 5th Edition, Cambridge University Press, 2009 |

**Reference Books**

| 1 | C.N. Rao, *Understanding Biotechnology*, 1st Edition, Universities Press, 2002 |
|---|---|
| 2 | Satyanarayana U., *Biotechnology*, 1st Edition, Books & Allied Pvt. Ltd., 2005 |

**Useful Links**

| 1 | https://www.cbit.ac.in/wp-content/uploads/2022/10/Biotechnology-Lab-safety-Rules.pdf |
|---|---|
| 2 | https://www.wright.edu/sites/www.wright.edu/files/page/attachments/basic-rules-of-biosafety.pdf |

**Chairperson**

| CO | Course Outcomes | CL | Class Session |
|-----|-----------------|-----|---------------|
| **CO1** | **Understand** the lab safety measures of the Biotechnology Labs | 2 | 4 |
| **CO2** | **Sterilize** labware and maintain aseptic conditions in a biotech lab | 2 | 4 |
| **CO3** | **Demonstrate** the proper use of microscopes and lab equipment | 3 | 4 |
| **CO4** | **Apply** basic calculations to prepare standard solutions and buffers | 3 | 4 |
| **CO5** | **Conduct** basic biomolecule analysis and biochemical techniques | 3 | 4 |

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## Department of Basic Sciences and Humanities

## Program: B. Tech First Year Group-B (BT)

| Semester-II | Applied Mathematics for Biotechnology (BSH41209) | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme (Th)** | | **Examination Scheme(P)** | |
| **Theory (Th)** | 4 Hrs/week | **CT-I** | 15 Marks | - | - |
| **Practical (P)** | - | **CT-II** | 15 Marks | - | - |
| **Total Credits** | **4 (Th) = 4** | **CA** | 10 Marks | - | - |
| Duration of ESE:3Hrs | | **ESE** | 60 Marks | - | - |
| | | **Total Marks** | **100 Marks** | - | - |

**Pre-Requisites:** NA

**Course Objectives:**

| | |
|---|---|
| 1 | To identify algebraic problems from practical areas and obtain the solution in certain cases. |
| 2 | To expose students to understand the basic importance of Differential Calculus. |
| 3 | To uion of simultaneous equation by matrix method. |
| 4 | To apply your understanding of the concepts, formulas, and problem-solving procedures. |

| | |
|---|---|
| **Unit I** | **Matrices:** Basics on Matrices, Adjoint of matrix, Inverse of a matrix, Trace, Rank of a matrix, Rank Nulity Theorem, System of linear equations, Consistency of a system of Equation, Eigen values and Eigen vectors for order, Cayley Hamilton Theorem. |
| | **Activity 1: Perform basic operations of matrices by Sagemath**<br>**Activity 2: Illustrate Eigen values and Eigen Vectors by Sagemath** |
| **Unit II** | **Differential Calculus:** Indeterminate Forms L'Hospital Rule, Taylor's and Maclaurin's series (for one variable), Maxima and Minima, Successive differentiation, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem |
| | **Activity1: To Learn Calculus with SageMath**<br>**Activity 2: Differential Calculus and its Application by Sagemath** |
| **Unit III** | **Integral Calculus:** Introduction to Gamma Function & Properties of Gamma Function, Introduction to Beta Function & Properties of Beta Function, Relation between Beta & Gamma Function, Leibnitz's rule for differentiation under integral sign, Tracing of Cartesian and Polar curves |
| | **Activity1: To trace the curve with Scilab**<br>**Activity 2: To trace the curve with Maple** |
| **Unit IV** | **Multiple Integration:** Double Integration- Cartesian and Polar, Change the order of Integration, Change into Polar Form, Triple Integration. |
| | **Activity 1.Application of integration by using Sagemath**<br>**Activity 2. Evaluation of Integration by using Sagemath.** |
| **Unit V** | **Differential Equation**: Review of first order differential equations, Linear and Exact differential equations, Application- Newtons Law Cooling, Second and higher order differential equations, Variation of parameters method, Cauchy-Legendres Linear equation |
| | **Activity 1. Mathematical verification of Newton's Law of Cooling practically. Activity 2. To solve Linear Differential Equation by Sagemath.** |

**Chairperson**

## Text Books

| | |
|---|---|
| T.1 | Higher Engineering Mathematics by Bali Lyenger (Laxmi Prakashan) 9$^{th}$ Edition |
| T.2 | Advance Engineering Mathematics by Ervin Kreysizig's 9$^{th}$ Edition |
| T.3 | H. K. Dass, Advanced Engineering Mathematics, S. Chand, Reprint, 2014. |
| T.4 | Outline Series, McGraw Hills, 4th Edition, 2016. |
| T.5 | P.N.Wartikar and J.N.Wartikar, Applied Mathematics, 4th Edition, Vidyarthi Griha Prakashan. |
| T.6 | G B Thomas and R.L. Finney, Calculus and Analytic geometry 9$^{th}$ edition, Pearson, Reprint2002. |

## Reference Books

| | |
|---|---|
| R.1 | GilbertStrang: Linear Algebra and Its Applications (Paperback), Nelson Engineering (2007) |
| R.2 | "Advanced Engineering Mathematics" by Erwin Kreyszig's (Wiley India) 9$^{th}$ edition |
| R.3 | A textbook of Engineering Mathematics by N.P. Bali, Manish Goyal, Laxmi Publication, Reprint 2010 |
| R.4 | Higher Engineering Mathematics by B. S. Grewal, Khanna Publisher 35$^{th}$ edition. |

| CO | Course Outcomes | CL | Class Sessions |
|---|---|---|---|
| CO1 | **Use** Matrix method to solve linear system of equations, evaluate eigen values - eigen vectors and its applications. | 3 | 9 |
| CO2 | **Apply** the concept of maxima, minima and successive differentiation in analysis of engineering problems. | 3 | 9 |
| CO3 | **Solve** improper integrals using beta, gamma functions | 3 | 9 |
| CO4 | **Utilize** fundamental theorems to compute integrals of both single-variable and multivariable functions. | 3 | 9 |
| CO5 | **Apply** appropriate methods to solve first order and higher order differential equations and apply it to find solution of engineering problems. | 3 | 9 |

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(An Autonomous Institution Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)

**Department of Basic Sciences and Humanities**

## Program: B.Tech First Year Group-B(BT)

| Semester-II | Semiconductor Physics & Optics: (BSH41207) | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme (Th)** | | **Examination Scheme(P)** | |
| **Theory (Th)** | 3 Hrs/week | **CT-I** | 15 Marks | - | - |
| **Practical(P)** | 2 Hrs/week | **CT-II** | 15 Marks | - | - |
| **Total Credits** | 3 (Th)+1 (P)=4 | **CA** | 10 Marks | **CA** | 25 Marks |
| Duration of ESE:3 Hrs | | | 60 Marks | **ESE** | 25 Marks |
| | | **Total Marks** | **100 Marks** | **-** | **50 Marks** |

**Pre-Requisites:** AICTE Bridge Course, Basics of Physics.

**Course Objectives:**

| | |
|---|---|
| 1. | To analyze the concept of cut in voltage, voltage regulator and current gain in PN junction diode, Zener diode and transistor respectively.To show the strong conceptual understanding of Crystallography with their types and application in various engineering field. |
| 2. | To interpret the motion of charged particle in electric field, magnetic field and cross configured field through Bethe's law, Cathode ray tube (CRT) and Cathode ray Oscilloscope (CRO). |
| 3. | To show the strong conceptual understanding of Crystal structure with their types and application in various engineering field. |
| 4. | To compare the interference of waves in parallel thin film, wedge shaped thin film and their application in engineering field. |
| 5. | To explain the Phenomenon, properties of optical fiber with their application in engineering field. |

### Course Contents

| | |
|---|---|
| **Unit I** | **Semiconductor Physics** :Introduction,Intrinsic semi conductors and Extrinsic Semi conductor, PN-Junction diode, Hall effect & voltage, Hall coefficient, its application, Zener diode, LED, Transistor (CB, CC& CE mode) |
| | **Activity 1:Circuit model making of P N Junction Diode/ light emitting diode/ Zener diode/Transistor** **Activity 2: Case Study on Semiconductor Material Application** |
| **Unit II** | **Electron Ballistics & Electron Optics:** Introduction of electric and magnetic field, Uniform Electric Field parallel to electron motion, Uniform Electric Field perpendicular to electron motion, Uniform Magnetic Field parallel to electron motion, Uniform Magnetic Field perpendicular to electron motion, Electric and Magnetic fields in cross configuration, Bethe's law, Devices: Cathode Ray tube, CRO, Block Diagram, Function & working of each block. |
| | **Activity 1: Game Pedagogy - Crossword Puzzle of Electron Ballistics & Electron Optics.** **Activity 2:Poster Presentation** |
| **Unit III** | **Crystal Structure:** Introduction, Classification of Crystal structure, Simple Cubic cell,Body Centered cubic cell, Face Centered cubic cell (SC, BCC, FCC), Elements of crystal, Unit cell and their types. Characteristics of Unit cell, Effective number of atoms per unit cell,atomic radius,nearest neighbor distance, coordination number, atomic packing factor, void space, density; Crystallographic planes and Miller indices, Bragg's law of diffraction and its equation. |
| | **Activity 1: Model making of different structure(SC,BCC,FCC)** **Activity 2: Open Book Test** |

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| Unit IV | **Wave Optics:** Introduction, thin film, Plane Parallel thin film, Wedge shaped thin film, Newton rings and its application, Antireflection coating. |
|---|---|
| | **Activity 1: PPT on classification of Parallel thin film and Wedge-shaped thin film with their application.** |
| | **Activity 2:Preparation of video clips** |
| Unit V | **Optical Fiber:** Propagation of light by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion. Applications of Optical fiber. |
| | **Activity 1: Context based learning & document making based activity.** |
| | **Activity 2:Multiple choice questions on Optical Fiber.** |

### Text Books

| T.1 | Avadhanulu, M.N., & Kshirsagar, P.G. (8th Revised Edition). A Textbook of Engineering Physics. S. Chand Publication. New Delhi. |
|---|---|
| T.2 | Subrahmanyam, N., Brij Lal, & Avadhanulu, M.N. (23rd Revised and Enlarged Edition, 2006). A Textbook of Optics. S. Chand Publication. New Delhi. |
| T.3 | Mehta, V.K., & Mehta, Rohit. (Multicolour Illustrative and Thoroughly Revised Tenth Edition, 2006). Principles of Electronics. S. Chand Publication. New Delhi. |

### Reference Books

| R.1 | ModernPhysics:TherajaB.L.,Reprint2$^{nd}$Edition,S.Chand&CO,NewDelhi. |
|---|---|
| R.2 | Solid State Physics:DekkerJ.,Reprint1$^{st}$Edition,McMillanIndiaLtd,Mumbai. |

### Useful Links

| 1 | https://nptel.ac.in/courses/115/102/115102124/ |
|---|---|
| 2 | https://nptel.ac.in/courses/115/106/115106128/ |
| 3 | https://nptel.ac.in/courses/104/101/104101130/ |

| LIST OF EXPERIMENTS (Semiconductor Physics & optics lab-BSH41208) | | |
|---|---|---|
| 1 | Determine the Cut in Voltage and Dynamic Resistance of P-N Junction Diode in Forward and Reverse Biased | CO1 |
| 2 | Determine the Break DownVoltage and Dynamic Resistance of Zener Diode | CO1 |
| 3 | Determination of Dynamic Resistance and Current Gain of Transistor in Common Base Mode. | CO1 |
| 4 | Determination of Dynamic Resistance and Current Gain of Transistor in Common Emitter. | CO1 |
| 5 | Determination of e/m ratio of an electron by Thomson method. | CO2 |
| 6 | Determine the ripple factor and rectification efficiency by Half Wave and Full Wave Rectifier using CRO. | CO2 |
| 7 | Determination of lattice constant and atomic packing fraction of simple cubic structure. | CO3 |
| 8 | Determination of the Wavelength of Sodium Light By Using Newton rings experiment. | CO4 |
| 9 | Determination of Fringe width by using Wedge shaped thin film. | CO4 |
| 10 | Determination of acceptance angle and numerical aperture using optical fiber kit. | CO5 |

### Text Books

| T.1 | Experiments in Engineering Physics:M.N.Avadhanulu,A.A.Dani,2$^{nd}$EditionS.Chand(G/L)&Company Ltd, New Delhi. |
|---|---|
| T.2 | A textbook of Practical Physics: Samir KumarGhosh,1$^{st}$Edition,NewCentralBookAgency, Kolkata. |

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| | Reference Books |
|---|---|
| R.1 | Engineering Physics: Dattu Joshi,Tata Mc Graw Hill Education, NewDelhi. |
| R.2 | A text book of Engineering physics:Dr.M.N.Avadhanulu, Dr.P.G.Kshirsagar, S.Chand Publication. |

**Useful Links**

| 1 | https://nptel.ac.in/courses/115/106/115106128/ |
|---|---|
| 2 | https://nptel.ac.in/courses/104/101/104101130/ |

| CO | Course Outcomes | CL | Class Sessions |
|---|---|---|---|
| CO1 | **Illustrate** p n junction diode, Zener diode ,Light emitting diode and transistor with their application in engineering field | 3 | 9 |
| CO2 | **Interpret** the concept of motion of charged particle in electric field, magnetic field and cross configured field. | 3 | 9 |
| CO3 | **Explain** the Crystal geometry, the behavior of solids and different characteristics of cubic crystal structure. | 4 | 9 |
| CO4 | **Analyze** the concept of interference in parallel and wedge shaped thin film and their application in engineering field. | 4 | 9 |
| CO5 | **Classify** types of optical fiber and their application in various fields. | 4 | 9 |

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**Department of Basic Sciences and Humanities**

## Program: B.Tech First Year Group-B(BT)

**Semester-II** — **Principle of Electrical Engineering: (BEE41201)**

| Teaching Scheme | | Examination Scheme (Th) | | Examination Scheme(P) | |
|---|---|---|---|---|---|
| **Theory (Th)** | 3 Hrs/week | **CT-I** | 15 Marks | - | - |
| **Practical (P)** | 2 Hrs/week | **CT-II** | 15 Marks | - | - |
| **Total Credits** | **3(Th)+1(P) = 4** | **CA** | 10 Marks | **CA** | 25 Marks |
| Duration of ESE:3Hrs | | **ESE** | 60 Marks | **ESE** | 25 Marks |
| | | **Total Marks** | **100 Marks** | - | **50 Marks** |

**Pre-Requisites: NA**.

**Course Objectives:**

| | |
|---|---|
| 1. | To understand and analyze basic electric and magnetic circuits. |
| 2. | To study the working principles of electrical machines and power converters. |
| 3. | To introduce the components of low-voltage electrical installations. |

### Course Contents

| | |
|---|---|
| **Unit I** | Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation Superposition Theorem. |
| **Unit II** | Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections |
| **Unit III** | Magnetic materials, BH characteristics, series and parallel magnetic circuits, ideal and practicaltransformer, equivalent circuit, losses in transformers, regulation and efficiency. Autotransformer and three-phase transformer connection |
| **Unit IV** | Introduction to Power Generation Thermal Hydro, Nuclear, Wind, Solar with Block SchematicPresentation Only. Single line diagram for Generation Transmission, Distribution through different Voltage levels. Low voltage distribution system Overhead Underground Single Phase Three Phase. Basic operation of UPS Invertors Block schematic representation. |
| **Unit V** | Protective Devices: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup. Illuminance: Lamps- fluorescent, CFL, LED. Electrical measuring instruments principle and applications energy meter, megger, tong tester. |

| Text Books | |
|---|---|
| T.1 | D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010. |
| T.2 | D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009. |
| T.3 | L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011. |

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| Reference Books | |
|---|---|
| R.1 | E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. |
| R.2 | Vincent Del Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989 |
| **Useful Links** | |
| 1 | https://digimat.in/nptel/courses/video/108105112/L01.html |
| 2 | https://archive.nptel.ac.in/courses/108/105/108105112/ |
| 3 | https://archive.nptel.ac.in/courses/108/105/108105053/ |

| LIST OF EXPERIMENTS( **Principle of Electrical Engineering Lab: BEE31203**) | | |
|---|---|---|
| **1** | Verification of Kirchhoff's laws (KVL & KCL) for given network. | CO1 |
| **2** | Verification of Superposition theorem for given network. | CO2 |
| **3** | Determination of resistance and inductance of choke coil | CO2 |
| **4** | Execute RLC series circuit operation and to plot Phasor diagram for it. | CO3 |
| **5** | Determination of Permeability & Saturation point for given magnetic material | CO3 |
| **6** | Detection of core losses and copper losses by performing open circuit test and short circuit test on single phase transformer | CO3 |
| **7** | Perform direct loading test on single-phase transformer to determine its efficiency & voltage regulation. | CO3 |
| **8** | Investigate the performance and efficiency of a UPS and an inverter in providing backup power during utility power interruptions. | CO4 |
| **9** | Explore the construction and working principles of a separately excited DC motor, including the role of field windings and armature. | CO4 |
| **10** | Explore the principles of insulation resistance measurement with a megger and clamp-on current measurement with a tong tester. | CO5 |

| Text Books | |
|---|---|
| T.1 | A Text Book of Electrical Technology: B. L. Thareja and A. K. Thareja, S. Chand Publication (Volume I, II & III). 2011 |
| T.2 | Rashid M.H, "Power Electronics: Circuits Devices and Applications", 3rd Edition, Pearson, 2011. |
| **Reference Books** | |
| R.1 | E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. |
| R.2 | D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009. |
| **Useful Links** | |
| 1 | https://nptel.ac.in/courses/117/106/117106034/ |
| 2 | https://nptel.ac.in/courses/108108076/ |
| 3 | https://nptel.ac.in/courses/108105062/ |

| CO | Course Outcomes | CL | Class Sessions |
|---|---|---|---|
| **CO 1** | **Describe** Kirchhoff's current and voltage laws to analyze and solve complex DC electrical circuits. | 2 | 9 |
| **CO 2** | **Interpret** single-phase and three-phase AC circuits, calculate power parameters, and make informed decisions regarding their applications. | 2 | 9 |
| **CO 3** | **Illustrate** and optimizing transformers and magnetic circuits with a focus on factors such as material characteristics, losses, and connection configurations. | 3 | 9 |
| **CO 4** | **Construct** various electric machines, including three-phase induction motors, separately excited DC motors, and synchronous generators. | 3 | 9 |
| **CO 5** | **Analyze** the types of wires and cables commonly used in electrical installations, considering their specifications and applications. | 4 | 9 |

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**Department of Basic Sciences and Humanities**

## Program: B.Tech First Year Group-B(BT)

| Semester-II | Cell Biology (BBT41201) | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme(Th)** | | **Examination Scheme(P)** | |
| **Lectures** | 2 Hrs/week | **CT-1** | 07 Marks | - | - |
| **Practical** | - | **CT-2** | 07 Marks | - | - |
| **SL** | - | **TA** | 06 Marks | - | - |
| **Total Credits** | **2(Th)** | **ESE** | 30 Marks | - | - |
| Duration of ESE:2Hrs | | **ESE** | **Total** | - | - |
| | | **Total Marks** | **50Marks** | - | - |

**Pre-Requisites:** NA

**Course Objectives:**

| 1. | To understand basic structure and function of cell and cellular organization in different organism. |
|---|---|
| 2. | To study different cell organelles and understand importance of cell organelles in different cell types. |

**Course Contents**

| Unit I | **Basic of cell biology** Definition of cell and tissue, discovery of cell, History of cell and contribution of different scientist- contribution of Robert hooke, Jan Evangelista purkyne, Matthias Jacob schleiden and Theodor Schwann, cell as basic unit of living organisms, cell theory. |
|---|---|
| Unit II | **Cell structure and Organization** Structure and organization of prokaryotic cell(Bacterial cell) and eukaryotic cell( algae,Fungii and Protozoa) and their general characters, structure and function of Animal and plant cells, Acellular organization in Virus, Classification of cell based on Cell shape, cell size , C/N ratio and Cell number. |
| Unit III | **Cell organelles** Concept of cell organelles, Organization of cellular organelles, Structure and function of Cytoplasm, Nucleus , Plasma membrane, Cell wall (Plant Cell), Golgi complex, Endoplasmic reticulum, Ribosomes, Lysosomes, Mitochondria and chloroplast. |

**Text Books**

| T.1 | Cell Biology C.B Pawar, 2005,Himalaya Publishing House |
|---|---|
| T.2 | Cell Biology ,Varma and Agrawal,2005, S.Chand Publication Delhi |

**Reference Books**

| R.1 | Cell and Molecular Biology, Gerals Karp, 2007, Jon willey and son, Pvt limited, |
|---|---|
| R.2 | Cell, B Lewin,2007,Jones and Bartlett publisher, London |

**Useful Links**

| 1 | https://www.asbmb.org/education/online-teaching/online-lab-work |
|---|---|
| 2 | http://biomodel.uah.es/en/lab/inicio.htm |

| CO | Course Outcomes | CL | Class Session |
|---|---|---|---|
| CO1 | **Understand** basic structure of cells in living organism, including their discovery. | 2 | 8 |
| CO2 | **Demonstrate** the knowledge about organization of cells in prokaryotic and eukaryotic organism and importance of cell in organism. | 3 | 9 |
| CO3 | **Use** structure and function of different cell organelles and its importance in cell functioning. | 2 | 8 |

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### Department of Basic Sciences and Humanities

## Program: B.Tech First Year Group-B(BT)

| Semester-II | C Language Lab (BIT41205) |
|---|---|

| Teaching Scheme | | | Examination Scheme | |
|---|---|---|---|---|
| Practical | 2 Hrs/week | | CT-1 | - |
| Tutorial | - | | CT-2 | - |
| Total Credits | 1 | | CA | 25 Marks |
| | | | ESE | 25 Marks |
| | | | Total | 50 Marks |
| | | | Duration of ESE: | - |

## Course Objective:

| 1 | To understand C language fundamentals and represent solutions using algorithms and flowcharts. |
|---|---|
| 2 | To apply operators and expressions to perform logical and arithmetic operations in C. |
| 3 | To Write and execute C programs using control structures and standard I/O functions. |

## Course Contents

| Unit I | **Introduction to C**: History of C, Features of C, Structure of C program, Character Set, C Tokens-Keywords, Identifiers, Constants, Variables, data types, Operators, variable declaration, Assigning Value to variable, <br> **Introduction to Computing**: Algorithm, Flowchart, Representation of Algorithm and Flowchart with examples. |
|---|---|
| Unit II | **Operator and Expression**: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional operator, Bitwise operators, sizeof operator, Arithmetic Expression, Evaluation expression. <br> **Programming Basics:** Components of C language. Standard I/O in C, Format Specifies, Writing and executing C program, Syntax and logical errors in compilation, object and executable code. |
| Unit III | **Statements-Selection statements (Decision Making):** IF, IF-ELSE, Nested IF-ELSE and switch statements with examples, Repetition statements (loops)- while, for, do-while statements with examples, Unconditional statements- break, continue, goto statements with examples. |

## Text Books

| 1 | Computer Programming with C, Special Edition-MRCET, Mc Graw Hill Publishers 2017. |
|---|---|
| 2 | Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning. |

## Reference Books

| 1 | Let us C , Yashwanth Kanethkar, 13th Edition, BPB Publications. |
|---|---|
| 2 | Computer Programming, E. Balagurusamy, First Edition, TMH. |
| 3 | The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, PHI. |

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| Useful Links | |
|---|---|
| 1 | https://youtu.be/-wv-OERJK3M |
| 2 | https://youtu.be/IdXrCPzNnkU |
| 3 | https://youtu.be/5AHRXOtn9bY |

| Sr. No. | List of Experiment | |
|---|---|---|
| 1 | Design a program to calculate simple interest(SI) for a given principal (P), time (T), and rate of interest (R) (SI = P*T*R/100) | CO1 |
| 2 | Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input. | CO1 |
| 3 | C program to read roll number and marks from user and display it on screen. | CO1 |
| 4 | Implement computational problems using arithmetic expressions | CO2 |
| 5 | C program to print 1 to 10 numbers using for loop. | CO2 |
| 6 | C Program to check Armstrong number using while loop | CO3 |
| 7 | Program to find greatest among 3 numbers using decision making statement | CO3 |
| 8 | Write a C program to construct a pyramid of numbers as follows  (using Looing Concept)<br><br>a)    1                    b)        *<br>      2  2                        *    *<br>      3  3  3                    *    *    *<br>      4  4  4  4                *    *    *    * | CO3 |
| 9 | Implement Problems involving if-then-else structures | CO3 |
| 10 | Micro Project | CO3 |

| CO | Course Outcomes | CL | Class Session |
|---|---|---|---|
| CO1 | **Understand** the problem and build an algorithm/flowchart to solve it | 2 | 4 |
| CO2 | **Illustrate** basic structure of C also perform the compilation execution process. | 3 | 4 |
| CO3 | **Execute** the C code to perform the operation using the decision making statement | 3 | 4 |

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**Department of Basic Sciences and Humanities**

## Program: B.Tech First Year Group-B(BT)

| Semester-II | Cell And Molecular Biology Lab (BBT41202) | | |
|---|---|---|---|

| Teaching Scheme | | | Examination Scheme | |
|---|---|---|---|---|
| **Lectures** | 2Hr / Week | | **ESE** | 25 Marks |
| **Tutorial** | - | | **CIE** | 25 Marks |
| **Practical** | - | | **Total** | 50 Marks |

**Practical Credit: 1**     **Duration of Exam:** 2 Hours

### Course Objectives

The Objectives of this course is:

| | |
|---|---|
| 1. | To understand basic methods of cell staining and microscopic observation . |
| 2. | To study different techniques of molecular biology for estimation of Different biomolecules. |

| Sr. No. | Experiments | CO |
|---|---|---|
| 1 | Observation and study of cell and tissue under compound microscope | CO-1 |
| 2 | Staining techniques for plant and animal cell. | CO-1 |
| 3 | Microscopic observation of root hairs and stomata | CO-2 |
| 4 | Demonstration of various phases of mitosis in onion roots. | CO-2 |
| 5 | Demonstration of southern Blotting | CO-3 |
| 6 | Paper chromatography technique for separation of amino acids. | CO-3 |
| 7 | Agarose gel electrophoresis of Nucleic acid. | CO-4 |
| 8 | Estimation of DNA by colorimetric method | CO-4 |
| 9 | Estimation of RNA by colorimetric method | CO-5 |
| 10 | Demonstration of Thin layer chromatography and SDS-PAGE. | CO-5 |

| Text Books | |
|---|---|
| T.1 | Molecular Biology of the Cell, Bruce Alberts, Alexander D. Johnson, Julian Lewis, et al., 6th Edition, 2014 |
| T.2 | Lehninger Principles of Biochemistry, David L. Nelson, Michael M. Cox, 8th Edition, 2021 |
| **Reference Books** | |
| R.1 | Biological Science, D.J. Taylor, N.P.O. Green, G.W. Stout, 3rd Edition, 1997. |
| R.2 | Principles and Techniques of Biochemistry and Molecular Biology, Keith Wilson and John Walker, 7th Edition, 2010. |
| **Useful Links** | |
| 1. | https://www.youtube.com/watch?v=CSrUm-EgTK4 |
| 2. | https://www.youtube.com/watch?v=w2wAYViQBXM |
| 3. | https://www.youtube.com/watch?v=hdmQaAycafc |

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| CO | Course Outcomes | CL | Hours |
|---|---|---|---|
| CO1 | **Describe** the structure and organization of plant and animal cells and tissues using compound microscopy. | 2 | 4 |
| CO2 | **Demonstrate** the identification of microscopic features. | 3 | 4 |
| CO3 | **Perform** molecular biology techniques including Southern blotting, agarose gel electrophoresis. | 3 | 4 |
| CO4 | **Examine** the principles and analyze the results of chromatographic techniques. | 4 | 4 |
| CO5 | **Analyze** practical skills and analyze data obtained from microscopy, staining, electrophoresis, and nucleic acid quantification techniques | 4 | 4 |

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**Department of Basic Sciences and Humanities**

## Program: B. Tech First Year Group-B (BT)

| Semester-II | **Professional Etiquette : BSH41105** | | | | |
|---|---|---|---|---|---|
| **Teaching Scheme** | | **Examination Scheme(Th)** | | **Examination Scheme(P)** | |
| **Theory (Th)** | - | CT-I | - | - | - |
| Practical (P) | 2 Hrs/week | CT-II | - | - | - |
| **Total Credits** | **1(P)** | CA | - | - | 25 marks |
| Duration of ESE: | | ESE | - | - | - |
| | | **Total Marks** | **-** | **-** | **25 Marks** |

**Pre-Requisites:**

**Course Objectives:**

| 1. | To list key elements of personal grooming & dressing etiquettes |
|---|---|
| 2. | To describe the characteristics and implications of various mindsets. |
| 3. | To differentiate between professional and unprofessional behaviors in various academic and social contexts. |

### Course Contents

| Unit I | **Personal Grooming & First Impression** Dressing Etiquette, Personal Cleanliness, Table Manners, Conversational Etiquette, Small Talk, Active Listening, Interruptions, Eye Contact, Smile, Handshake |
|---|---|
| | **Activity** : 1. Roleplay For meeting someone for the first time 2. Demonstration for table manners at a professional dinner. |
| Unit II | **Introduction to Habit Formation & Soft Skills** Meaning & Importance of Professional Etiquette & Soft Skills , Day to Day Manners, Definitions and Types of Mindset, Developing Learning Mindset & Growth Mindsets, Planning And Goal-Setting, Introduction to Habit Formation, Identifying various habits, Habit Cycle: Breaking Non-Productive Habits ,Using The Zeigarnik Effect For Productivity And Personal Growth, Developing Habits Of Success |
| | **Activity** : 1. Prepare a personal goal vision board 2. Identification of productive habits & non-productive habits through a worksheet |
| Unit III | **Workplace Manners** Meeting, Introduction at Meetings , Digital Etiquette, Workplace Ethics , Email Etiquette |
| | **Activity** :1.Writing a formal email 2.Case Study for understanding the real life scenario |

**Text Books**

| T.1 | The Essentials of Business Etiquette by Barbara Pachter, McGraw Hill Education |
|---|---|
| T.2 | Soft Skills- Enhancing Employability, M. S. Rao, I. K. International |

**Reference Books**

| R.1 | Seven Habits of Highly Effective People by Steven Covey |
|---|---|
| R.2 | You Can Win by Shiv Khera |
| R.3 | Corporate Soft Skills by Sarvesh Gulati |

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| Sheet No. | List of Experiments | |
|:---:|:---|:---:|
| 1 | To understand the importance of first impressions through grooming, dress, and body language. | CO1 |
| 2 | To demonstrate proper table manners in a formal professional setting. | CO1 |
| 3 | To develop non-verbal communication skills through eye contact and active listening | CO1 |
| 4 | To visualize personal and professional goals through the creation of a vision board. | CO2 |
| 5 | To identify and analyze productive and non-productive habits. | CO2 |
| 6 | To understand the impact of mindset on learning and personal growth | CO2 |
| 7 | To plan and manage time effectively through goal-setting and habit tracking. | CO2 |
| 8 | To practice professional communication skills through formal email writing. | CO3 |
| 9 | To analyze workplace scenarios for ethical behavior and decision-making. | CO3 |
| 10 | To understand digital etiquette in professional online communication. | CO3 |

| CO | Course Outcomes | CL | Class Session |
|:---:|:---|:---:|:---:|
| CO1 | **Understand** the key elements of personal grooming and appropriate dressing etiquette for academic and professional environments. | 2 | 4 |
| CO2 | **Formulate** a personalized action plan for developing a growth mindset, setting realistic academic goals, and adopting positive habits for self-improvement. | 3 | 4 |
| CO3 | **Demonstrate** between professional conduct across academic, social and virtual setting throw role play and discursion. | 4 | 4 |

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| **Chairperson** |

### Department of Basic Sciences and Humanities

**Program: B. Tech First Year Group – B (BT)**

**SEMESTER-II Digital Wellness & Basic Communication Lab - BSH41104**

| Teaching Scheme | | Examination Scheme (Th) | | Examination Scheme (P) | |
|---|---|---|---|---|---|
| Theory (Th) | - | CT-I | -- | - | -- |
| Practical (P) | 4 Hrs./ Week | CT-II | -- | - | -- |
| Total Credits | 2 (P) | CA | -- | CA | 25 Marks |
| Duration of ESE: -- | | ESE | -- | ESE | 25 Marks |
| | | Total  Marks | – | -- | 50 Marks |

**Pre-Requisites:-**

**Course Objectives:-**

| 1. | To introduce the concept of digital wellness and its importance in modern life. |
|---|---|
| 2. | To train students in using digital tools responsibly and maintaining mental health in digital environments. |
| 3. | To develop an understanding of effective communication in professional settings. |
| 4. | To develop written and oral communication skills for business contexts. |
| 5. | To enable students to present themselves professionally in online and offline environments. |

### Course Contents

| Unit-I | **The Basics of Digital Wellness –** Introduction to Digital Wellness, Attention, Distraction, Principles and Practices from Yoga Philosophy, Techniques for developing Attention through Yoga, Difference between Stimulation and Relaxation, Attention Enhancers. |
|---|---|
| Unit-II | **Science of Addiction and De-addiction** – Habits and Addiction, Harnessing the Power of Neuroplasticity, Science and the Benefits of Physical Exercise. |
| Unit-III | **Digital Detox –** Techniques of Digital Detox, Seven-week Digital Wellness Plan, Digital Screens and Eye Health in Children. |
| Unit-IV | **Introduction to Business Communication** - Definition, types, and significance 7 C's of effective Communication, Barriers to communication and overcoming them, Verbal vs non-verbal Communication. |
| Unit-V | **Written and Oral Communication**- Email writing (professional emails), Report writing and Proposals, Business letters and memos, Resume and cover letter writing, Presentation skills, Public speaking and group discussions, Interviews (mock interviews), Meeting etiquettes. |

**Text Books:-**

| T1. | "Digital Wellness" publish Brahma Kumaris by Prajapita Vishwa Vidyalaya, Pandav Bhawan. Mount Abu, Rajasthan |
|---|---|
| T2. | "Business Communication" by Peter Hartley and Clive G. Bruckmann |
| T3. | "Business English for Success" by Scott McLean |

**Reference Books:-**

| R1. | Adair, John. Effective Communication. London: Pan Macmillan Ltd., 2003. |
|---|---|
| R2. | Carnegie, Dale. The Quick and Easy Way to Effective Speaking. New York: Pocket Books, 1977. |
| R3. | Guffey, Mary Ellen. Essentials of Business Writing. Ohio: South Western College Pubg., 2000. |

**Chairperson**

| | **List of Experiments** | **CO** |
|---|---|---|
| **1** | Introduction to Digital Wellness: A Study on Attention and Distraction | **CO1** |
| **2** | Enhance the Attention through Yoga | **CO1** |
| **3** | Habits and Addiction – Harnessing the Power of Neuroplasticity | **CO2** |
| **4** | Challenge of Digital Detox | **CO2** |
| **5** | Comparison Between Digital Reading and Print Reading | **CO3** |
| **6** | Create a Personal Digital Wellness Plan | **CO3** |
| **7** | Explore and build the Foundations for Better Communication | **CO4** |
| **8** | Navigate from Barriers to Bridges | **CO4** |
| **9** | Mastering Business Writing Skills | **CO5** |
| **10** | Develop Professional Communication Competence | **CO5** |

| **CO** | **Course Outcomes** | **CL** | **Class Sessions** |
|---|---|---|---|
| **CO1** | **Identify** the awareness of digital wellness principles and implement best practices | 1 | 4 |
| **CO2** | **Explain** professionalism and etiquettes in physical and virtual workspaces. | 1 | 4 |
| **CO3** | Summarize digital tools for productivity and effective professional communication | 2 | 4 |
| **CO4** | **Understand** key concepts of business and digital communication | 2 | 4 |
| **CO5** | **Apply** appropriate written and oral communication strategies in a business setting | 3 | 4 |

| | | | | **July, 2025** | **4.00** | **Applicable for AY 2025-26 Onwards** |
|---|---|---|---|---|---|---|
| **Chairperson** | **Dean Academics** | **Vice Principal** | **Principal** | **Date of Release** | **Version** | |