# JUIT

## B.TECH CURRICULUM


**JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY**
**(Established by H.P. State Legislative vide Act No. 14 of 2002)**
**Waknaghat (H.P.) INDIA**

# INDEX

# BIOINFORMATICS

# JUIT
# B.TECH CURRICULUM

# BIOINFORMATICS

## I SEMESTER (B1)

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B11PD301 | PRESENTATION AND COMMUNICATION SKILLS | 3 | 3 |
| | 07B11PD302 | ENGLISH (AUDIT COURSE) | | |
| 2. | 07B11MA101 | MATHEMATICS-I OR | 4 | 4 |
| | 08B11MA108 | BASIC MATHEMATICS | | |
| 3. | 07B11PH101 | PHYSICS-I | 4 | 4 |
| 4. | 07B12BI101 | METABOLIC NETWORKS | 4 | 4 |
| 5. | 07B11CI101 | INTRODUCTION TO COMPUTERS & PROGRAMMING | 4 | 4 |
| 6. | 07B11PH701 | PHYSICS LAB-I | 2 | 1 |
| 7. | 07B12BI701 | METABOLIC NETWORKS LAB | 2 | 1 |
| 8. | 07B11CI701 | COMPUTER PROGRAMMING LAB. | 4 | 2 |
| 9. | 07B11GE951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

## II SEMESTER (B2)

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B11PD102 | GROUP AND CO-OPERATIVE PROCESSES | 3 | 3 |
| 2. | 07B21MA102 | MATHEMATICS-II OR | 4 | 4 |
| | 08B21MA109 | BASIC MATHEMATICS -II | | |
| 3. | 07B21PH103 | BIOPHYSICAL TECHNIQUES | 4 | 4 |
| 4. | 07B22BI102 | STRUCTURAL BIOLOGY | 4 | 4 |
| 5. | 07B21CI102 | DATA STRUCTURES | 4 | 4 |
| 6. | 07B21PH703 | BIOPHYSICAL TECHNIQUES LAB. | 2 | 1 |
| 7. | 07B22BI702 | STRUCTURAL BIOLOGY LAB. | 2 | 1 |
| 8. | 07B21CI702 | DATA STRUCTURES & COMPUTER PROGRAMMING LAB. | 4 | 2 |
| 9. | 07B22BI952 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

**III SEMESTER (B3)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B31PD303 | MANAGERIAL ECONOMICS | 3 | 3 |
| 2. | 07B31MA104 | PROBABILITY | 4 | 4 |
| 3. | 07B31CI104 | DATABASE SYSTEMS | 4 | 4 |
| 4. | 07B32BI103 | BIOLOGICAL COMPUTATION | 4 | 4 |
| 5. | 07B31BT103 | MICROBIOLOGY | 4 | 4 |
| 6. | 07B31CI704 | DATABASE SYSTEMS LAB. | 2 | 1 |
| 7. | 07B31BT704 | MICROBIOLOGY LAB | 2 | 1 |
| 8. | 07B32BI703 | BIOLOGICAL COMPUTATION LAB | 2 | 1 |
| 9. | 07B32BI704 | BIOLOGICAL DATABASES LAB | 2 | 1 |
| | | **Total** | **27** | **23** |

**IV SEMESTER (B4)**

| S.No. | Subject Code | Subject | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B41PD104 | FINANCIAL MANAGEMENT | 3 | 3 |
| 2. | 07B41MA107 | BIOSTATISTICS | 4 | 4 |
| 3. | 07B41PH106 | STATISTICAL THERMODYNAMICS | 4 | 4 |
| 4. | 07B42BI104 | MOLECULAR GENETICS | 4 | 4 |
| 5. | 07B31CI103 | OBJECT ORIENTED PROGRAMMING | 4 | 4 |
| 6. | 07B42BI705 | MOLECULAR GENETICS LAB. | 2 | 1 |
| 7. | 07B42BI706 | MOLECULAR SIMULATION LAB | 2 | 1 |
| 8. | 07B42BI707 | BIOPROGRAMMING LAB | 2 | 1 |
| 9. | 07B31CI703 | OBJECT ORIENTED PROGRAMMING LAB | 2 | 1 |
| 10. | 07B41GE101 | ENVIRONMENTAL STUDIES | 3 | 3 |
| | | **Total** | **30** | **26** |

**V SEMESTER (B5)**

| S.No. | Subject Code | Subject | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B51PD305 | SOCIAL AND LEGAL ISSUES | 3 | 3 |
| 2. | 07B41CI106 | FUNDAMENTALS OF ALGORITHMS | 4 | 4 |
| 3. | 07B52BI105 | MOLECULAR IMAGING AND DESIGN | 4 | 4 |
| 4. | 07B51BT109 | GENETIC ENGINEERING | 4 | 4 |
| 5. | 07B51BT110 | IMMUNOLOGY | 4 | 4 |
| 6. | 08B52BT112 | SCRIPTING LANGUAGES FOR BIOINFORMATICS | 4 | 4 |
| 7. | 07B41CI707 | ALGORITHMS LAB. | 2 | 1 |
| 8. | 07B52BI708 | MOLECULAR IMAGING AND DESIGN LAB. | 2 | 1 |
| 9. | 07B51BT711 | GENETIC ENGINEERING LAB. | 2 | 1 |
| 10. | 07B51BT712 | IMMUNOLOGY LAB. | 2 | 1 |
| 11. | 08B52BT714 | SCRIPTING LANGUAGES FOR BIOINFORMATICS LAB. | 2 | 1 |
| | | **Total** | **33** | **28** |

**VI SEMESTER (B6)**

| S.No. | Subject Code | Subject | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B61PD106 | PROJECT MANAGEMENT | 3 | 3 |
| 2. | 07B61BT111 | COMPARATIVE & FUNCTIONAL GENOMICS | 4 | 4 |
| 3. | 07B62BI106 | ADVANCED CHEMOINFORMATICS | 4 | 4 |
| 4. | 07B62BI107 | MACHINE LEARNING FOR BIOINFORMATICS | 4 | 4 |
| 5. | 07B62BI108 | DRUG DESIGNING TECHNIQUES | 4 | 4 |
| 6. | 08B62BT114 | ADVANCED ALGORITHMS FOR BIOINFORMATICS | 4 | 4 |
| 7. | 07B61BT713 | COMPARATIVE & FUNCTIONAL GENOMICS LAB. | 2 | 1 |
| 8. | 07B62BI709 | CHEMOINFORMATICS LAB. | 2 | 1 |
| 9. | 07B62BI710 | MACHINE LEARNING FOR BIOINFORMATICS LAB. | 2 | 1 |
| 10. | 07B62BI711 | DRUG DESIGNING TECHNIQUES LAB. | 2 | 1 |
| 11. | 08B62BT716 | ADVANCED ALGORITHMS FOR BIOINFORMATICS LAB. | 2 | 1 |
| | | **Total** | **33** | **28** |

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**VII SEMESTER (B7)**

| S.No. | Subject Code | Subject | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | | PD– ELECTIVE - I | 3 | 3 |
| 2. | | DE-I | 3 | 3 |
| 3. | | DE-II | 3 | 3 |
| 4. | | DE-III | 3 | 3 |
| 5. | 07B72BI901 | PROJECT PART-I | 20 | 10 |
| | | **Total** | **32** | **22** |

**List of Electives DE-I, DE-II, DE-III**

| S.No. | Subject Code | Subject Title |
|---|---|---|
| 1 | 07B72BI401 | SYSTEMS BIOLOGY |
| 2 | 07B72BI402 | MICROBIAL GENOMICS |
| 3 | 07B71BT404 | CLINICAL TRIALS & DBM |
| 4 | 07B72BI404 | QUANTITATIVE STRUCTURE ACTIVITY RELATIONSHIP |
| 5 | 07B72BI405 | PROTEIN SIMULATION & MODELING |
| 6 | 07B72BI406 | BI HIGH THROUGHPUT SCREENING |
| 7 | 07B72BI407 | HUMAN GENOME & THERAPEUTICS |
| 8 | 07B72BI408 | VISUAL COMPUTING |

## PD ELECTIVE - I

| | |
|---|---|
| 07B71PD601 | ENTREPRENEURIAL DEVELOPMENT |
| 07B71PD602 | MANAGING AND MARKETING OF TECHNOLOGY |

**VIII SEMESTER (B8)**

| S.No. | Subject Code | Subject | | Contact Hours | Credits |
|---|---|---|---|---|---|
| 1. | | PD – ELECTIVE - II | | 3 | 3 |
| 2. | | DE-IV | | 3 | 3 |
| 3. | | DE-V | | 3 | 3 |
| 4. | | DE-VI | | 3 | 3 |
| 5. | 07B72BI902 | PROJECT PART-II | | 20 | 10 |
| | | | **Total** | **32** | **22** |

## List of Electives DE-IV, DE-V, DE-VI

| S.No. | Subject Code | Subject |
|---|---|---|
| 1 | 07B72BI409 | ANIMAL GENOMICS |
| 2 | 07B72BI410 | PATHOGEN GENOMES |
| 3 | 07B72BI411 | TOOL DESIGN IN BIOINFORMATICS |
| 4 | 07B72BI412 | PHARMACOGENOMICS |
| 5 | 07B72BI413 | ARTIFICIAL INTELLIGENCE FOR BIOINFORMATICS |
| 6 | 07B72BI414 | ALGORITHMS IN MOLECULAR BIOLOGY |
| 7 | 07M3KI411 | PATTERN RECOGNITION |
| 8 | 07B72BI416 | IMMUNOCOMPUTING |
| 9 | 07B72BI416 | CYBERNETICS |

## PD ELECTIVE - II

07B81PD109 TOTAL QUALITY MANAGEMENT
07B81PD108 KNOWLEDGE MANAGEMENT

# BIOTECHNOLOGY

# BIOTECHNOLOGY

## I SEMESTER (B1)

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1. | 07B11PD301 | PRESENTATION AND COMMUNICATION SKILLS | 3 | 3 |
| | 07B11PD302 | ENGLISH (AUDIT COURSE) | | |
| 2. | 07B11MA101<br>08B11MA108 | MATHEMATICS-I OR<br>BASIC MATHEMATICS | 4 | 4 |
| 3. | 07B11PH101 | PHYSICS-I | 4 | 4 |
| 4. | 07B11EC101 | ELECTRICAL CIRCUIT ANALYSIS | 4 | 4 |
| 5. | 07B11CI101 | INTRODUCTION TO COMPUTERS AND PROGRAMING | 4 | 4 |
| 6. | 07B11PH701 | PHYSICS LAB-1 | 2 | 1 |
| 7. | 07B11EC701 | ELECTRICAL CIRCUITS LAB | 2 | 1 |
| 8. | 07B11CI 701 | COMPUTER PROGRAMMING LAB. | 4 | 2 |
| 9. | 07B11GE951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

## II SEMESTER (B2)

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B21PD102 | GROUP AND CO-OPERATIVE PROCESSES | 3 | 3 |
| 2. | 07B21MA102<br>08B21MA109 | MATHEMATICS-II OR<br>BASIC MATHEMATICS -II | 4 | 4 |
| 3 | 07B21PH103 | BIOPHYSICAL TECHNIQUES | 4 | 4 |
| 4 | 07B21EC102 | BASIC ELECTRONICS DEVICES AND CIRCUITS | 4 | 4 |
| 5 | 07B21CI102 | DATA STRUCTURES | 4 | 4 |
| 6 | 07B21BT701 | BASIC BIOSCIENCE LAB | 2 | 1 |
| 7 | 07B21EC702 | BASIC ELECTRONICS LAB | 2 | 1 |
| 8 | 07B21CI702 | DATA STRUCTURES & COMPUTER PROGRAMMING LAB. | 4 | 2 |
| 9 | 07B21BT952 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

**III SEMESTER (B3)**

| S.No. | Subject Code | Subject Title | | Contact hours | Credits |
|---|---|---|---|---|---|
| 1 | 07B31PD303 | MANAGERIAL ECONOMICS | | 3 | 3 |
| 2 | 07B31MA104 | PROBABILITY & STATISTICS | | 4 | 4 |
| 3 | 07B31BT101 | THERMODYNAMICS & CHEMICAL PROCESSES | | 4 | 4 |
| 4 | 07B31BT102 | BIOCHEMISTRY | | 4 | 4 |
| 5 | 07B31BT103 | MICROBIOLOGY | | 4 | 4 |
| 6 | 07B31BT702 | THERMODYNAMICS & CHEMICAL PROCESSES LAB | | 2 | 1 |
| 7 | 07B31BT703 | BIOCHEMISTRY LAB | | 2 | 1 |
| 8 | 07B31BT704 | MICROBIOLOGY LAB. | | 4 | 2 |
| | | | **Total** | **27** | **23** |

**IV SEMESTER (B4)**

| S.No. | Subject Code | Subject Title | | Contact hours | Credits |
|---|---|---|---|---|---|
| 1 | 07B41PD104 | FINANCIAL MANAGEMENT | | 3 | 3 |
| 2 | 07B41BT104 | GENETICS | | 4 | 4 |
| 3 | 07B41PH104 | BIOMATERIAL SCIENCE | | 4 | 4 |
| 4 | 07B41BT105 | CELL CULTURE TECHNOLOGY | | 4 | 4 |
| 5 | 07B41BT106 | MOLECULAR BIOLOGY | | 4 | 4 |
| 6 | 07B41BT705 | GENETICS LAB | | 2 | 1 |
| 6 | 07B41BT706 | ANIMAL TISSUE CULTURE LAB | | 2 | 1 |
| 7 | 07B41BT707 | PLANT TISSUE CULTURE LAB. | | 2 | 1 |
| 8 | 07B41BT708 | MOLECULAR BIOLOGY LAB. | | 2 | 1 |
| 9 | 07B41GE101 | ENVIRONMENTAL STUDIES | | 3 | 3 |
| | | | **Total** | **30** | **26** |

**V SEMESTER (B5)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B51PD305 | SOCIAL AND LEGAL ISSUES | 3 | 3 |
| 2 | 07B51BT107 | INTRODUCTION TO BIOINFORMATICS | 4 | 4 |
| 3 | 07B51BT108 | PROCESS ENGINEERING | 4 | 4 |
| 4 | 07B51BT109 | GENETIC ENGINEERING | 4 | 4 |
| 5 | 07B51BT110 | IMMUNOLOGY | 4 | 4 |
| 6 | 07B41BT301 | GLP & INSTRUMENTATION | 4 | 4 |
| 7 | 07B51BT709 | BIOINFORMATICS LAB | 2 | 1 |
| 8 | 07B51BT710 | PROCESS ENGINEERING LAB. | 2 | 1 |
| 9 | 07B51BT711 | GENETIC ENGINEERING LAB. | 2 | 1 |
| 10 | 07B51BT712 | IMMUNOLOGY LAB. | 2 | 1 |
| 11 | 07B41BT861 | GLP & INSTRUMENTATION LAB | 2 | 1 |
| | | **Total** | **33** | **28** |

**VI SEMESTER (B6)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B61PD106 | PROJECT MANAGEMENT | 3 | 3 |
| 2 | 07B61BT111 | COMPARATIVE AND FUNCTIONAL GENOMICS | 4 | 4 |
| 3 | 07B61BT112 | FOOD AND AGRICULTURAL BIOTECHNOLOGY | 4 | 4 |
| 4 | 07B61BT113 | CELL AND DEVELOPMENTAL BIOLOGY | 4 | 4 |
| 5 | 07B61BT114 | FERMENTATION TECHNOLOGY PROCESSING | 4 | 4 |
| 6 | 08B61BT113 | DIAGNOSTICS & VACCINE MANUFACTURE TECHNOLOGIES | 4 | 4 |
| 7 | 07B61BT713 | COMPARATIVE AND FUNCTIONAL GENOMICS LAB | 2 | 1 |
| 8 | 07B61BT714 | FOOD AND AGRICULTURAL BIOTECHNOLOGY LAB | 2 | 1 |
| 9 | 07B61BT715 | CELL AND DEVELOPMENTAL BIOLOGY LAB. | 2 | 1 |
| 10 | 07B61BT716 | FERMENTATION TECHNOLOGY AND DOWNSTREAM PROCESSING LAB. | 2 | 1 |
| 11 | 07B61GE953 | INDUSTRIAL TRAINING | | 0 |
| 12 | 08B51BT113<br>08B61BT715 | DIAGNOSTICS & VACCINE MANUFACTURE TECHNOLOGIES LAB | 2 | 1 |
| | | **Total** | **33** | **28** |

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**VII SEMESTER (B7)**

| SN | Subject Code | Subject | Contact hours | Credits |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - I | 3 | 3 |
| 2 | | DE-I | 3 | 3 |
| 3 | | DE-II | 3 | 3 |
| 4 | | DE-III | 3 | 3 |
| 5 | 07B71BT901 | PROJECT PART I | 20 | 10 |
| | | **Total** | **32** | **22** |

## List of Electives for DE-I, DE-II and DE- III

| | | |
|---|---|---|
| 1 | 07B71BT401 | BIOCHEMICAL AND MOLECULAR BIOLOGY CALCULATIONS |
| 2 | 07B71BT402 | BIOCOMPUTING AND APPLICATIONS |
| 3 | 07B71BT403 | BIOMATERIALS |
| 4 | 07B71BT404 | CLINICAL TRIALS AND DATABASE MANAGEMENT |
| 5 | 07B71BT405 | COMPUTER AIDED DRUG DESIGN |
| 6 | 07B71BT406 | ENVIRONMENTAL BIOTECHNOLOGY |
| 7 | 07B71BT407 | IMMUNOTECHNOLOGY |
| 8 | 07B71BT408 | MICROBIAL ECOLOGY AND DIVERSITY |
| 9 | 07B71BT409 | MOLECULAR DIAGNOSTICS |
| 10 | 07B71BT410 | PLANT BIOTECHNOLOGY |
| 11 | 07B61BT304 | PROCESS ANALYSIS AND DESIGN |
| 12 | 07B71BT412 | PROTEIN MODELLING |
| 13 | 07B71BT413 | SAFETY AND HAZARD MANAGEMENT |
| 14 | 07B71BT414 | STEM CELLS AND HEALTHCARE |
| 15 | 07B71BT415 | TECHNO ECONOMIC BIOFEASIBILITY REPORTING |
| 16 | 07B71BT416 | THERAPEUTIC HORMONES AND GROWTH FACTORS |

## PD ELECTIVE - I

| | |
|---|---|
| 07B71PD601 | ENTREPRENEURIAL DEVELOPMENT |
| 07B71PD602 | MANAGING AND MARKETING OF TECHNOLOGY |

**VIII SEMESTER (B8)**

| S.No. | Subject Code | Subject | Contact hours | Credits |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - II | 3 | 3 |
| 2 | | DE-IV | 3 | 3 |
| 3 | | DE-V | 3 | 3 |
| 4 | | DE-VI | 3 | 3 |
| 5 | 07B81BT902 | PROJECT PART II | 20 | 10 |
| | | **Total** | **32** | **22** |

## List of Electives for DE-IV, V and VI

| | | |
|---|---|---|
| 1 | 07B81BT417 | ANIMAL TISSUE CULTURE |
| 2 | 07B81BT418 | BIOTERRORISM |
| 3 | 07B81BT419 | CANCER BIOLOGY |
| 4 | 07B81BT420 | CELL & TISSUE ENGINEERING |
| 5 | 07B81BT421 | INDUSTRIAL ENZYMES |
| 6 | 07B81BT422 | INTEGRATED SYSTEMS BIOLOGY |
| 7 | 07B81BT423 | INTELLECTUAL PROPERTY RIGHTS AND BIOETHICS |
| 8 | 07B81BT424 | MANUFACTURING PROCESSES AND QUALITY CONTROL |
| 9 | 07B81BT425 | PHARMACOGENOMICS |
| 10 | 07B81BT426 | PROTEIN ENGINEERING AND APPLICATIONS |
| 11 | 07B81BT427 | RHIZOSPHERIC BIOTECHNOLOGY |

## PD ELECTIVE - II

| | |
|---|---|
| 07B8 PD109 | TOTAL QUALITY MANAGEMENT |
| 07B81PD108 | KNOWLEDGE MANAGEMENT |

# SIX- YEAR INTEGRATED
# DUAL DEGREE
# B PHARM-M.PHARM PRACTICE

## SIX- YEAR INTEGRATED DUAL DEGREE B PHARM-M.PHARM PRACTICE
### B PHARM
### SEMESTER B1
### 2008-14 BATCH

| SN | Sub Code | Subject | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B11PD301 | PRESENTATION AND COMMUNICATION SKILLS OR | 3 | 3 |
| | 07B11PD302 | ENGLISH | | |
| 2 | 08B11PY101 | BASIC BIOLOGY OR | 4 | 4 |
| | 08B11MA108 | BASIC MATHEMATICS - I | | |
| 3 | 08B11PY102 | GENERAL PHARMACY | 4 | 4 |
| 4 | 08B11PY103 | PHARMACEUTICAL INORGANIC CHEMISTRY | 4 | 4 |
| 5 | 07B11CI101 | INTRODUCTION TO COMPUTERS AND PROGRAMING | 4 | 4 |
| 6 | 08B11PY702 | GENERAL PHARMACY LAB | 2 | 1 |
| 7 | 08B11PY703 | PHARMACEUTICAL INORGANIC CHEMISTRY LAB | 2 | 1 |
| 8 | 07B11CI701 | COMPUTER PROGRAMMING LAB. | 4 | 2 |
| 9 | 07B11GE951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

## SIX- YEAR INTEGRATED DUAL DEGREE B PHARM-M.PHARM PRACTICE
### B PHARM
### SEMESTER B2
### 2008-14 BATCH

| SN | Sub Code | Subject | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B21PD102 | GROUP AND CO-OPERATIVE PROCESSES | 3 | 3 |
| 2 | 08B21PY104 | HUMAN ANATOMY AND PHYSIOLOGY | 4 | 4 |
| 3 | 08B21PY105 | PHARMACEUTICAL ORGANIC CHEMISTRY -I | 4 | 4 |
| 4 | 08B21PY106 | PHYSICAL PHARMACY | 4 | 4 |
| 5 | 08B21MA109 | BASIC MATHEMATICS -II | 4 | 4 |
| 6 | 08B21PY704 | HUMAN ANATOMY AND PHYSIOLOGY LAB | 2 | 1 |
| 7 | 08B21PY705 | PHARMACEUTICAL ORGANIC CHEMISTRY - I LAB | 4 | 2 |
| 8 | 08B21PY706 | PHYSICAL PHARMACY LAB | 2 | 1 |
| 9 | 07B21GE952 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

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# CIVIL ENGINEERING

# CIVIL ENGINEERING

## I SEMESTER (B1)

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B11PD301 | PRESENTATION & COMMUNICATION SKILLS / ENGLISH | 3 | 3 |
| 2. | 07B11MA101 | MATHEMATICS - I | 4 | 4 |
| 3. | 07B11PH101 | PHYSICS- I | 4 | 4 |
| 4. | 07B11CI101 | INTRODUCTION TO COMPUTER AND PROGRAMMING | 4 | 4 |
| 5. | 07B11EC101 | ELECTRICAL CIRCUIT ANALYSIS | 4 | 4 |
| 6. | 07B11PH701 | PHYSICS LAB- I | 2 | 1 |
| 7. | 07B11CI701 | COMPUTER PROGRAMMING LAB | 4 | 2 |
| 8. | 07B11EC701 | ELECTRICAL CIRCUIT LAB | 2 | 1 |
| 9. | 07B11GE 951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

## II SEMESTER (B2)

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B21PD102 | GROUP AND COOPERATIVE PROCESSES | 3 | 3 |
| 2. | 07B21MA102 | MATHEMATICS – II | 4 | 4 |
| 3. | 07B21CI102 | DATA STRUCTURES | 4 | 4 |
| 4. | 07B21CE101 | ENGINEERING MECHANICS | 4 | 4 |
| 5. | 07B22CL241 | CHEMISTRY | 4 | 4 |
| 6. | 07B21CI702 | DATA STRUCTURE & COMPUTER PROGRAMMING LAB | 4 | 2 |
| 7. | 07B21CE701 | WORKSHOP PRACTICES | 2 | 1 |
| 8. | 07B22CL801 | CHEMISTRY LAB | 2 | 1 |
| 9. | 07B21CE951 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

**III SEMESTER (B3)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B31PD303 | MANAGERIAL ECONOMICS | 3 | 3 |
| 2. | 07B31MA106 | NUMERICAL METHODS | 4 | 4 |
| 3. | 07B31EC103 | ELECTRICAL MACHINES & INSTRUMENTS | 4 | 4 |
| 4. | 07B31CE101 | MECHANICS OF SOLIDS | 4 | 4 |
| 5. | 07B31CE102 | FLUID MECHANICS | 4 | 4 |
| 6. | 07B31EC703 | ELECTRICAL MACHINES AND INSTRUMENTS LAB | 2 | 1 |
| 7. | 07B31CE702 | FLUID MECHANICS LAB | 2 | 1 |
| 8. | 07B31CE701 | ENGINEERING GRAPHICS & CAD LAB | 4 | 2 |
| | | **Total** | **27** | **23** |

**IV SEMESTER (B4)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B41PD104 | FINANCIAL MANAGEMENT | 3 | 3 |
| 2. | 07B41CE101 | STRUCTURAL ANALYSIS | 4 | 4 |
| 3. | 07B41CE102 | GEOTECHNICAL ENGINEERING | 4 | 4 |
| 4. | 07B41CE103 | SURVEYING | 4 | 4 |
| 5. | 07B41CE104 | ENGINEERING MATERIALS | 4 | 4 |
| 6. | 07B41CE703 | SURVEYING LAB | 4 | 2 |
| 7. | 07B41CE702 | GEOTECHNICAL LAB | 4 | 2 |
| 8. | 07B41GE101 | ENVIRONMENTAL STUDIES | 3 | 3 |
| | | **Total** | **30** | **26** |

**V SEMESTER (B5)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B51PD305 | SOCIAL AND LEGAL ISSUES | 3 | 3 |
| 2. | 07B51CE102 | DESIGN OF CONCRETE STRUCTURES | 4 | 4 |
| 3. | 07B51CE101 | HIGHWAY ENGINEERING | 4 | 4 |
| 4. | 07B41CE103 | DESIGN OF HYDRAULIC STRUCTURES | 4 | 4 |
| 5. | 07B51CE104 | CONSTRUCTION TECHNOLOGY & MANAGEMENT | 4 | 4 |
| 6. | 08B51CE105 | WATER SUPPLY ENGINEERING | 4 | 4 |
| 7. | 07B51CE701 | HIGHWAY ENGINEERING LAB | 2 | 1 |
| 8. | 07B51CE703 | COMPUTER AIDED PLANNING & COSTING | 4 | 2 |
| 9. | 07B61CE705 | CONCRETE LAB | 2 | 1 |
| 10. | 08B51CE705 | ENVIRONMENTAL ENGG. LAB-I | 2 | 1 |
| | | **Total** | **33** | **28** |

**VI SEMESTER (B6)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | 07B61PD106 | PROJECT MANAGEMENT | 3 | 3 |
| 2. | 07B61CE101 | DESIGN OF STEEL STRUCTURES | 4 | 4 |
| 3. | 08B61CE105 | SEWAGE TREATMENT AND DISPOSAL | 4 | 4 |
| 4. | 07B61CE103 | FOUNDATION ENGINEERING | 4 | 4 |
| 5. | 07B61CE104 | TRANSPORTATION ENGINEERING | 4 | 4 |
| 6. | 08B61CE106 | ADVANCED STRUCTURAL ANALYSIS | 4 | 4 |
| 7. | 07B61CE703 | FOUNDATION ENGINEERING LAB | 2 | 1 |
| 8. | 07B61CE704 | CIVIL ENGINEERING SOFTWARE LAB | 2 | 1 |
| 9. | 08B61CE705 | ENVIRONMENTAL ENGG. LAB-II | 4 | 2 |
| 10. | 08B61CE706 | SEMINAR | 0 | 1 |
| | | **Total** | **33** | **28** |

**VII SEMESTER (B7)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | | PD– ELECTIVE - I | 3 | 3 |
| 2. | 07B71CE401-405 | DE 1 | 3 | 3 |
| 3. | 07B71CE411-413 | DE 2 | 3 | 3 |
| 4. | 07B71CE421-425 | DE 3 | 3 | 3 |
| 5. | 07B71CE901 | PROJECT , PART-I | 30 | 15 |
| | | **Total** | **42** | **27** |

# List of Electives

**Elective 1**

| | | |
|---|---|---|
| 1. | 07B71CE401 | DESIGN OF WATER & WASTEWATER TREATMENT PLANTS |
| 2. | 07B71CE402 | WASTE MANAGEMENT |
| 3. | 07B71CE403 | ENVIRONMENTAL MANAGEMENT & IMPACT ASSESSMENT |
| 4. | 07B71CE404 | ENERGY RESOURCES & CONSERVATION |
| 5. | 07B71CE405 | CONSTRUCTION SAFETY & HEALTH |

**Elective 2**

| | | |
|---|---|---|
| 6. | 07B71CE411 | HYDROPOWER ENGINEERING |
| 7. | 07B71CE412 | DAM AND RESERVOIR DESIGN |
| 8. | 07B71CE413 | ESTIMATING & COSTING |

**Elective 3**

FROM OTHER DEPARTMENTS

| | | |
|---|---|---|
| 9. | 07B71CE421 | AIR POLLUTION MONITORING & CONTROL |
| 10. | 07B71CE422 | UNDERGROUND TECHNOLOGY |
| 11. | 07B71CE423 | ADVANCED CONCRETE TECHNOLOGY |
| 12. | 07B71CE424 | ANALYSIS OF STRUCTURES BY MATRIX APPROACH |
| 13. | 07B71CE425 | MECHANICAL & ELECTRICAL SYSTEMS IN BUILDINGS |

**PD ELECTIVE - I**

| | |
|---|---|
| 07B71PD601 | ENTREPRENEURIAL DEVELOPMENT |
| 07B71PD602 | MANAGING AND MARKETING OF TECHNOLOGY |

**VIII SEMESTER (B8)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1. | | PD– ELECTIVE - II | 3 | 3 |
| 2. | 07B81CE401-406 | DE 4 | 3 | 3 |
| 3. | 07B81CE411-416 | DE 5 | 3 | 3 |
| 4. | 07B81CE421-426 | DE 6 | 3 | 3 |
| 5. | 07B81CE901 | PROJECT, PART-II | 30 | 15 |
| | | **Total** | **42** | **27** |

# List of Electives

**Elective 4**

| | | |
|---|---|---|
| 1. | 07B81CE401 | ADVANCED RCC DESIGN |
| 2. | 07B81CE402 | GROUND IMPROVEMENT TECHNIQUES |
| 3. | 07B81CE403 | INDOOR AIR QUALITY & NOISE CONTROL |
| 4. | 07B81CE404 | ADVANCED HYDROPOWER ENGINEERING |
| 5. | 07B81CE405 | TRAFFIC ENGINEERING |
| 6. | 07B81CE406 | CONSTRUCTION TECHNIQUES |

**Elective 5**

| | | |
|---|---|---|
| 7. | 07B81CE411 | FEM AND ITS APPLICATIONS TO CIVIL ENGINEERING |
| 8. | 07B81CE412 | SOIL DYNAMICS & MACHINE FOUNDATIONS |
| 9. | 07B81CE413 | SUSTAINABLE DESIGN & CONSTRUCTION |
| 10. | 07B81CE414 | OPERATION & MAINTENANCE OF HYDROPOWER PROJECT |
| 11. | 07B81CE415 | HIGHWAY CONSTRUCTION, MAINTENANCE & MANAGEMENT |
| 12. | 07B81CE416 | CONSTRUCTION CONTRACTS & LAWS |

**Elective 6**

| | | |
|---|---|---|
| 13. | 07B81CE421 | EARTHQUAKE ENGINEERING |
| 14. | 07B81CE422 | PRESTRESSED CONCRETE STRUCTURES |
| 15. | 07B81CE423 | DESIGN OF WATER SUPPLY & SEWAGE DISPOSAL SYSTEMS |
| 16. | 07B81CE424 | RIVER ENGINEERING |
| 17. | 07B81CE425 | ADVANCED PAVEMENT DESIGN |
| 18. | 07B81CE426 | CONSTRUCTION PLANNING & CONTROL |

## PD ELECTIVE - II

| | |
|---|---|
| 07B81PD109 | TOTAL QUALITY MANAGEMENT |
| 07B81PD108 | KNOWLEDGE MANAGEMENT |

# COMPUTER SCIENCE & ENGINEERING

## COMPUTER SCIENCE & ENGINEERING

### I SEMESTER (B1)

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | 07B11PD301 | PRESENTATION AND COMMUNICATION SKILLS | 3 | 3 |
| 2 | 07B11MA101 | MATHEMATICS-I | 4 | 4 |
| 3 | 07B11PH101 | PHYSICS-I | 4 | 4 |
| 4 | 07B11EC101 | ELECTRICAL CIRCUIT ANALYSIS | 4 | 4 |
| 5 | 07B11CI101 | INTRODUCTION TO COMPUTERS AND PROGRAMMING | 4 | 4 |
| 6 | 07B11PH701 | PHYSICS LAB-I | 2 | 1 |
| 7 | 07B11EC701 | ELECTRICAL CIRCUITS LAB | 2 | 1 |
| 8 | 07B11CI701 | COMPUTER PROGRAMMING LAB | 4 | 2 |
| 9 | 07B11GE951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

### II SEMESTER (B2)

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | 07B21PD102 | GROUP AND COOPERATIVE PROCESSES | 3 | 3 |
| 2 | 07B21MA103 | DISCRETE MATHEMATICS | 4 | 4 |
| 3 | 07B21PH102 | PHYSICS-II | 4 | 4 |
| 4 | 07B21EC102 | BASIC ELECTRONIC DEVICES AND CIRCUITS | 4 | 4 |
| 5 | 07B21CI102 | DATA STRUCTURES | 4 | 4 |
| 6 | 07B21PH702 | PHYSICS LAB-II | 2 | 1 |
| 7 | 07B21EC702 | BASIC ELECTRONICS LAB | 2 | 1 |
| 8 | 07B21CI702 | DATA STRUCTURES AND COMPUTER PROGRAMMING LAB | 4 | 2 |
| 9 | 07B21CI952 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

**III SEMESTER (B3)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | 07B31PD303 | MANAGERIAL ECONOMICS | 3 | 3 |
| 2 | 07B21MA102 | MATHEMATICS-II | 4 | 4 |
| 3 | 07B41EC107 | DIGITAL ELECTRONICS | 4 | 4 |
| 4 | 07B31CI103 | OBJECT ORIENTED PROGRAMMING | 4 | 4 |
| 5 | 07B31CI104 | DATABASE SYSTEMS | 4 | 4 |
| 6 | 07B41EC707 | DIGITAL ELECTRONICS LAB | 2 | 1 |
| 7 | 07B31CI703 | OBJECT ORIENTED PROGRAMMING LAB | 2 | 1 |
| 8 | 07B31CI704 | DATABASE SYSTEMS LAB | 2 | 1 |
| 9 | 07B31CI705 | UNIX PROGRAMMING LAB | 2 | 1 |
| | | **Total** | **27** | **23** |

**IV SEMESTER (B4)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | 07B41PD104 | FINANCIAL MANAGEMENT | 3 | 3 |
| 2 | 07B41MA106 | PROBABILITY THEORY AND RANDOM PROCESSES | 4 | 4 |
| 3 | 07B31EC104 | SIGNALS AND SYSTEMS | 4 | 4 |
| 4 | 07B41CI105 | MICROPROCESSORS AND CONTROLLERS | 4 | 4 |
| 5 | 07B41CI106 | FUNDAMENTALS OF ALGORITHMS | 4 | 4 |
| 6 | 07B31EC704 | SIGNALS AND SYSTEMS LAB | 2 | 1 |
| 7 | 07B41CI706 | MICROPROCESSORS AND CONTROLLERS LAB | 2 | 1 |
| 8 | 07B41CI707 | ALGORITHMS LAB | 2 | 1 |
| 9 | 07B42CI702 | MULTIMEDIA DEVELOPMENT LAB I | 2 | 1 |
| 10 | 07B41GE101 | ENVIRONMENTAL STUDIES | 3 | 3 |
| | | **Total** | **30** | **26** |

**18**

**V SEMESTER (B5)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | 07B51PD305 | SOCIAL AND LEGAL ISSUES | 3 | 3 |
| 2 | 07B51EC241 | COMMUNICATION SYSTEMS | 4 | 4 |
| 3 | 07B51CI107 | OPERATING SYSTEMS | 4 | 4 |
| 4 | 07B51CI108 | SOFTWARE ENGINEERING | 4 | 4 |
| 5 | 07B51CI109 | THEORY OF COMPUTATION | 4 | 4 |
| 6 | 08B31CI105 | SOFTWARE TESTING AND DEBUGGING | 4 | 4 |
| 7 | 08B31CI706 | SOFTWARE TESTING AND DEBUGGING LAB | 2 | 1 |
| 8 | 07B51EC801 | COMMUNICATION SYSTEMS LAB | 2 | 1 |
| 9 | 07B51CI708 | OPERATING SYSTEMS LAB | 2 | 1 |
| 10 | 07B51CI709 | SOFTWARE ENGINEERING LAB | 2 | 1 |
| 11 | 07B52CI703 | WEB TECHNOLOGY LAB | 2 | 1 |
| | | **Total** | **37** | **28** |

**VI SEMESTER (B6)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | 07B61PD106 | PROJECT MANAGEMENT | 3 | 3 |
| 2 | 07B61CI110 | COMPUTER NETWORKS | 4 | 4 |
| 3 | 07B61CI111 | COMPILER DESIGN | 4 | 4 |
| 4 | 07B61CI112 | COMPUTER ORGANIZATION AND ARCHITECTURE | 4 | 4 |
| 5 | 07B61PH105 | MATERIAL SCIENCE | 4 | 4 |
| 6 | 08B61CI113 | DATA ANALYSIS AND SIMULATION TECHNIQUES | 4 | 4 |
| 7 | 08B61CI713 | SIMULATION TECHNIQUES LAB | 2 | 1 |
| 9 | 07B61CI710 | COMPUTER NETWORKS LAB | 2 | 1 |
| 10 | 07B61CI711 | COMPILER DESIGN LAB | 2 | 1 |
| 11 | 07B61CI712 | SYSTEM AND NETWORK PROGRAMMING LAB | 4 | 2 |
| 12 | 07B61GE961 | INDUSTRIAL TRAINING | | 0 |
| | | **Total** | **37** | **28** |

**19**

**VII SEMESTER (B7)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - I | 3 | 3 |
| 2 | | DE-I | 3 | 3 |
| 3 | | DE-II | 3 | 3 |
| 4 | | DE-III | 3 | 3 |
| 5 | 08B71CI905 | PROJECT PART-I | 20 | 10 |
| | | **Total** | **32** | **22** |

## List of Electives for DE-I, DE-II and DE-III

| S.No. | Subject Code | Subject Title |
|---|---|---|
| 1 | 07B71CI401 | ARTIFICIAL INTELLEGENCE |
| 2 | 07B71CI402 | COMPUTER GRAPHICS |
| 3 | 07B71CI403 | DESIGN OF DATABASE SYSTEMS |
| 4 | 07B71EC541 | DIGITAL SIGNAL PROCESSING AND APPLICATIONS |
| 5 | 07B71CI404 | GRAPH ALGORITHMS AND APPLICATIONS |
| 6 | 07B71CI411 | INFORMATION RETRIEVAL AND DATA MINING |
| 7 | 07B71EC403 | INFORMATION THEORY AND APPLICATIONS |
| 8 | 07B71EC404 | MOBILE COMMUNICATIONS |
| 9 | 07B71CI405 | MULTI-DIMENSIONAL DATA STRUCTURES |
| 10 | 07B71PH401 | NANO SCIENCE AND TECHNOLOGY |
| 11 | 07B71CI406 | NETWORK PROGRAMMING |
| 12 | 07B71CI407 | PRINCIPLES OF PROGRAMMING LANGUAGES |
| 13 | 07B71CI408 | SOFT COMPUTING |
| 14 | 07B71CI409 | SOFTWARE ENGINEERING MANAGEMENT |
| 15 | 07B71CI410 | THEORY OF KNOWLEDGE, LEARNING, AND RESEARCH |
| 16 | 07B71MA406 | GRAPH THEORY |

**PD ELECTIVE - I**

| | |
|---|---|
| 07B71PD601 | ENTREPRENEURIAL DEVELOPMENT |
| 07B71PD602 | MANAGING AND MARKETING OF TECHNOLOGY |

**20**

**VIII SEMESTER (B8)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credit |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - II | 3 | 3 |
| 2 | | DE-IV | 3 | 3 |
| 3 | | DE-V | 3 | 3 |
| 4 | | DE-VI | 3 | 3 |
| 5 | 08B81CI906 | PROJECT PART-II | 20 | 10 |
| | | **Total** | **32** | **22** |

## List of Electives for DE-IV, DE-V and DE-VI

| S.No. | Subject Code | Subject Title |
|---|---|---|
| 1 | 07B81CI412 | DESIGN OF ALGORITHMS |
| 2 | 07B81CI413 | EMBEDDED SYSTEMS |
| 3 | 07B81CI414 | PARALLEL PROCESSING |
| 4 | 07B81CI415 | SYSTEMS PROGRAMMING |
| 5 | 07B81CI416 | NETWORK MANAGEMENT |
| 6 | 07B81CI417 | IMAGE PROCESSING |
| 7 | 07B81EC407 | DIGITAL TV |
| 8 | 07B82CI404 | COMPUTER GAMES |
| 9 | 07B82CI405 | CRYPTOGRAPHY AND NETWORK SECURITY |
| 10 | 07B82CI408 | HUMAN ASPECTS FOR INFORMATION TECHNOLOGY |
| 11 | 07B81MA408 | INTEGRAL TRANSFORMS |
| 12 | 07B81MA409 | PARTIAL DIFFERENTIAL EQUATIONS |

**PD ELECTIVE - II**

| | |
|---|---|
| 07B81PD109 | TOTAL QUALITY MANAGEMENT |
| 07B81PD108 | KNOWLEDGE MANAGEMENT |

# ELECTRONICS AND COMMUNICATION ENGINEERING

# ELECTRONICS AND COMMUNICATION ENGINEERING

## I SEMESTER (B1)

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B11PD301 | PRESENTATION AND COMMUNICATION SKILL | 3 | 3 |
| | 07B11PD302 | ENGLISH (Audit) | | |
| 2 | 07B11MA101 | MATHEMATICS-I | 4 | 4 |
| 3 | 07B11PH101 | PHYSICS-I | 4 | 4 |
| 4 | 07B11EC101 | ELECTRICAL CIRCUIT ANALYSIS | 4 | 4 |
| 5 | 07B11CI101 | INTRODUCTION TO COMPUTERS AND PROGRAMMING | 4 | 4 |
| 6 | 07B11PH801 | PHYSICS LAB-1 | 2 | 1 |
| 7 | 07B11EC701 | ELECTRICAL CIRCUITS LAB | 2 | 1 |
| 8 | 07B11CI701 | COMPUTER PROGRAMMING LAB | 4 | 2 |
| 9 | 07B11GE951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

## II SEMESTER (B2)

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B21PD102 | GROUP AND COOPERATIVE PROCESSES | 3 | 3 |
| 2 | 07B21MA103 | DISCRETE MATHEMATICS | 4 | 4 |
| 3 | 07B21PH102 | PHYSICS - II | 4 | 4 |
| 4 | 07B21EC102 | BASIC ELECTRONIC DEVICES AND CIRCUITS | 4 | 4 |
| 5 | 07B21CI102 | DATA STRUCTURES | 4 | 4 |
| 6 | 07B21PH702 | PHYSICS LAB - II | 2 | 1 |
| 7 | 07B21EC702 | BASIC ELECTRONICS LAB | 2 | 1 |
| 8 | 07B21CI702 | DATA STRUCTURES AND COMPUTER PROGRAMMING LAB | 4 | 2 |
| 9 | 07B21EC952 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

**III SEMESTER (B3)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B31PD303 | MANAGERIAL ECONOMICS | 3 | 3 |
| 2 | 07B21MA102 | MATHEMATICS II | 4 | 4 |
| 3 | 07B31EC103 | ELECTRICAL MACHINES AND INSTRUMENTS | 4 | 4 |
| 4 | 07B31EC104 | SIGNALS AND SYSTEMS | 4 | 4 |
| 5 | 07B31EC105 | ANALOGUE ELECTRONICS | 4 | 4 |
| 6 | 07B31EC703 | ELECTRICAL MACHINES AND INSTRUMENTS LAB | 2 | 1 |
| 7 | 07B31EC704 | SIGNALS AND SYSTEMS LAB | 2 | 1 |
| 8 | 07B31EC705 | ANALOGUE ELECTRONICS LAB | 2 | 1 |
| 9 | 07B42CI702 | MULTIMEDIA DEVELOPMENT LAB I | 2 | 1 |
| | | **Total** | **27** | **23** |

**IV SEMESTER (B4)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B41PD104 | FINANCIAL MANAGEMENT | 3 | 3 |
| 2 | 07B41MA106 | PROBABILITY THEORY AND RANDOM PROCESSES | 4 | 4 |
| 3 | 07B41EC106 | SEMICONDUCTOR DEVICES | 4 | 4 |
| 4 | 07B41EC107 | DIGITAL ELECTRONICS | 4 | 4 |
| 5 | 07B41EC108 | ANALOGUE COMMUNICATIONS | 4 | 4 |
| 6 | 07B41EC706 | DEVICES AND CIRCUIT SIMULATION LAB | 2 | 1 |
| 7 | 07B41EC707 | DIGITAL ELECTRONICS LAB | 2 | 1 |
| 8 | 07B41EC708 | ANALOGUE COMMUNICATIONS LAB | 2 | 1 |
| 9 | 07B31CI705 | UNIX PROGRAMMING LAB | 2 | 1 |
| 10 | 07B41GE101 | ENVIRONMENTAL STUDIES | 3 | 3 |
| | | **Total** | **30** | **26** |

**V SEMESTER (B5)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B51PD305 | SOCIAL AND LEGAL ISSUES | 3 | 3 |
| 2 | 07B51EC109 | DIGITAL COMMUNICATIONS | 4 | 4 |
| 3 | 07B51EC110 | DIGITAL SIGNAL PROCESSING | 4 | 4 |
| 4 | 07B41CI105 | MICROPROCESSORS AND CONTROLLERS | 4 | 4 |
| 5 | 07B51EC111 | ELECTROMAGNETIC ENGINEERING | 4 | 4 |
| 6 | 07B51EC709 | DIGITAL COMMUNICATIONS LAB | 2 | 1 |
| 7 | 07B51EC710 | DIGITAL SIGNAL PROCESSING LAB | 2 | 1 |
| 8 | 07B41CI706 | MICROPROCESSORS AND CONTROLLERS LAB | 2 | 1 |
| 9 | 07B51EC711 | ELECTROMAGNETICS LAB | 2 | 1 |
| 10 | 07B71 EC401 | CONTROL SYSTEMS | 4 | 4 |
| 11 | 08B51 EC712 | CONTROL SYSTEMS LAB | 2 | 1 |
| | | **Total** | **33** | **28** |

**VI SEMESTER (B6)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | 07B61PD106 | PROJECT MANAGEMENT | 3 | 3 |
| 2 | 07B61EC112 | TELECOMMUNICATION NETWORKS | 4 | 4 |
| 3 | 07B61EC113 | VLSI TECHNOLOGY AND APPLICATIONS | 4 | 4 |
| 4 | 07B61PH105 | MATERIAL SCIENCE | 4 | 4 |
| 5 | 07B61CI241 | OBJECT ORIENTED SYSTEMS AND PROGRAMMING | 4 | 4 |
| 6 | 07B61EC712 | TELECOMMUNICATION NETWORKS LAB | 2 | 1 |
| 7 | 07B61EC713 | VLSI LAB | 2 | 1 |
| 9 | 07B61CI801 | OBJECT ORIENTED SYSTEMS AND PROGRAMMING LAB | 4 | 2 |
| 10 | 07B61GE953 | INDUSTRIAL TRAINING | | 0 |
| 11 | 07B81EC408 | POWER ELECTRONICS | 4 | 4 |
| 12 | 07B81EC701 | POWER ELECTRONICS LAB | 2 | 1 |
| | | **Total** | **33** | **28** |

**24**

**VII SEMESTER (B7)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - I | 3 | 3 |
| 2 | | DE-I | 3 | 3 |
| 3 | | DE-II | 3 | 3 |
| 4 | | DE-III | 3 | 3 |
| 5 | 07B72CI901 | PROJECT PART I | 20 | 10 |
| | | **Total** | **32** | **22** |

# List of Electives
## (To be updated from time to time)

| | | |
|---|---|---|
| 1 | 07B71EC401 | CONTROL SYSTEMS |
| 2 | 07B71EC402 | SATELLITE COMMUNICATION |
| 3 | 07B71EC403 | INFORMATION THEORY AND APPLICATIONS |
| 4 | 07B71EC404 | MOBILE COMMUNICATIONS |
| 5 | 07B71EC405 | RF AND MICROWAVE ENGINEERING |
| 6 | 07B71CI402 | COMPUTER GRAPHICS |
| 7 | 07B71CI404 | GRAPH ALGORITHMS AND APPLICATIONS |
| 8 | 07B71CI406 | NETWORK PROGRAMMING |
| 9 | 07B71CI408 | SOFT COMPUTING |
| 10 | 07B71CI410 | THEORY OF KNOWLEDGE, LEARNING, AND RESEARCH |
| 11 | 07B71CI411 | INFORMATION RETRIEVAL AND DATA MINING |
| 12 | 07B81MA406 | GRAPH THEORY |

**PD ELECTIVE - I**

| | |
|---|---|
| 07B71PD601 | ENTREPRENEURIAL DEVELOPMENT |
| 07B71PD602 | MANAGING AND MARKETING OF TECHNOLOGY |

**VIII SEMESTER (B8)**

| S.No. | Subject Code | Subject Title | Contact hours | Credits |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - I | 3 | 3 |
| 2 | | DE-IV | 3 | 3 |
| 3 | | DE-V | 3 | 3 |
| 4 | | DE-VI | 3 | 3 |
| 5 | 07B81EC902 | PROJECT PART II | 20 | 10 |
| | | **Total** | **32** | **22** |

## List of Electives
**(To be updated from time to time)**

| | | |
|---|---|---|
| 1 | 07B81EC406 | OPTICAL COMMUNICATIONS |
| 2 | 07B81EC407 | DIGITAL TV |
| 3 | 07B81EC408 | POWER ELECTRONICS |
| 4 | 07B81EC409 | ANTENNA THEORY AND APPLICATIONS |
| 5 | 07B81EC410 | ERROR CONTROL CODING |
| 6 | 07B82CI404 | COMPUTER GAMES |
| 7 | 07B82CI405 | CRYPTOGRAPHY AND NETWORK SECURITY |
| 8 | 07B82CI408 | HUMAN ASPECTS FOR INFORMATION TECHNOLOGY |
| 9 | 07B81CI413 | EMBEDDED SYSTEMS |
| 10 | 07B81CI414 | PARALLEL PROCESSING |
| 11 | 07B81CI415 | SYSTEMS PROGRAMMING |
| 12 | 07B81CI417 | IMAGE PROCESSING |
| 13 | 07B81MA408 | INTEGRAL TRANSFORMATIONS |
| 14 | 07B81MA409 | PARTIAL DIFFERENTIAL EQUATIONS |
| 15 | 07B81PH604 | QUANTUM COMPUTING |
| 16 | 07B81PH605 | PHOTONICS AND APPLICATIONS |

**PD ELECTIVE - II**

| | |
|---|---|
| 07B81PD109 | TOTAL QUALITY MANAGEMENT |
| 07B81PD108 | KNOWLEDGE MANAGEMENT |

# INFORMATION TECHNOLOGY

# INFORMATION TECHNOLOGY

## I SEMESTER (B1)

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B11PD301<br>07B11PD302 | PRESENTATION AND COMMUNICATION SKILLS<br>ENGLISH (AUDIT) | 3 | 3 |
| 2 | 07B11MA101 | MATHEMATICS I | 4 | 4 |
| 3 | 07B11PH101 | PHYSICS I | 4 | 4 |
| 4 | 07B11CI101 | INTRODUCTION TO COMPUTERS AND PROGRAMMING | 4 | 4 |
| 5 | 07B11EC101 | ELECTRICAL CIRCUIT ANALYSIS | 4 | 4 |
| 6 | 07B11EC701 | ELECTRICAL CIRCUITS LAB | 2 | 1 |
| 7 | 07B11PH701 | PHYSICS LAB-I | 2 | 1 |
| 8 | 07B11CI701 | COMPUTER PROGRAMMING LAB | 4 | 2 |
| 9 | 07B11GE951 | INSTITUTIONAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

## II SEMESTER (B2)

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B21PD102 | GROUP AND COOPERATIVE PROCESSES | 3 | 3 |
| 2 | 07B21MA103 | DISCRETE MATHEMATICS | 4 | 4 |
| 3 | 07B21EC | BASIC ELECTRONIC DEVICES AND CIRCUITS | 4 | 4 |
| 4 | 07B21PH102 | PHYSICS II | 4 | 4 |
| 5 | 07B21CI102 | DATA STRUCTURES | 4 | 4 |
| 6 | 07B21PH702 | PHYSICS LAB-II | 2 | 1 |
| 7 | 07B21EC702 | BASIC ELECTRONICS LAB | 2 | 1 |
| 8 | 07B21CI702 | DATA STRUCTURES AND COMPUTER PROGRAMMING LAB | 4 | 2 |
| 9 | 07B22CI952 | DEPARTMENTAL ORIENTATION | 2 | 0 |
| | | **Total** | **29** | **23** |

**27**

**III SEMESTER (B3)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B31PD303 | MANAGERIAL ECONOMICS | 3 | 3 |
| 2 | 07B21MA102 | MATHEMATICS-II | 4 | 4 |
| 3 | 07B41EC107 | DIGITAL ELECTRONICS | 4 | 4 |
| 4 | 07B31CI103 | OBJECT ORIENTED PROGRAMMING | 4 | 4 |
| 5 | 07B31CI104 | DATABASE SYSTEMS | 4 | 4 |
| 6 | 07B41EC707 | DIGITAL ELECTRONICS LAB | 2 | 1 |
| 7 | 07B31CI703 | OBJECT ORIENTED PROGRAMMING LAB | 2 | 1 |
| 8 | 07B31CI704 | DATABASE SYSTEMS LAB | 2 | 1 |
| 9 | 07B31CI705 | UNIX PROGRAMMING LAB | 2 | 1 |
| | | **Total** | **27** | **23** |

**IV SEMESTER (B4)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B41PD104 | FINANCIAL MANAGEMENT | 3 | 3 |
| 2 | 07B41MA106 | PROBABILITY THEORY AND RANDOM PROCESSES | 4 | 4 |
| 3 | 07B31EC104 | SIGNALS AND SYSTEMS | 4 | 4 |
| 4 | 07B42CI101 | COMPUTER ORGANIZATION | 4 | 4 |
| 5 | 07B41CI106 | FUNDAMENTALS OF ALGORITHMS | 4 | 4 |
| 6 | 07B41GE101 | ENVIRONMENTAL STUDIES | 3 | 3 |
| 7 | 07B31EC704 | SIGNALS AND SYSTEMS LAB | 2 | 1 |
| 8 | 07B42CI701 | COMPUTER ORGANIZATION LAB | 2 | 1 |
| 9 | 07B41CI707 | ALGORITHMS LAB | 2 | 1 |
| 10 | 07B42CI702 | MULTIMEDIA DEVELOPMENT LAB I | 2 | 1 |
| | | **Total** | **30** | **26** |

**V SEMESTER (B5)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B51PD305 | SOCIAL AND LEGAL ISSUES | 3 | 3 |
| 2 | 07B51EC241 | COMMUNICATION SYSTEMS | 4 | 4 |
| 3 | 07B51CI107 | OPERATING SYSTEMS | 4 | 4 |
| 4 | 07B51CI108 | SOFTWARE ENGINEERING | 4 | 4 |
| 5 | 07B52CI102 | WEB APPLICATION ENGINEERING | 4 | 4 |
| 6 | 07B31CI105 | SOFTWARE TESTING AND DEBUGGING | 4 | 4 |
| 7 | 07B31CI706 | SOFTWARE TESTING AND DEBUGGING LAB | 2 | 1 |
| 8 | 07B51EC801 | COMMUNICATION SYSTEMS LAB | 2 | 1 |
| 9 | 07B51CI708 | OPERATING SYSTEMS LAB | 2 | 1 |
| 10 | 07B51CI709 | SOFTWARE ENGINEERING LAB | 2 | 1 |
| 11 | 07B52CI703 | WEB TECHNOLOGY LAB | 2 | 1 |
| | | **Total** | **37** | **28** |

**VI SEMESTER (B6)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | 07B61PD106 | PROJECT MANAGEMENT | 3 | 3 |
| 2 | 07B61CI110 | COMPUTER NETWORKS | 4 | 4 |
| 3 | 07B62CI103 | INFORMATION SYSTEMS | 4 | 4 |
| 4 | 07B61PH105 | MATERIAL SCIENCE | 4 | 4 |
| 5 | 07B62CI104 | DATA MINING | 4 | 4 |
| 6 | 08B61CI113 | DATA ANALYSIS AND SIMULATION TECHNIQUES | 4 | 4 |
| 7 | 08B61CI713 | SIMULATION TECHNIQUES LAB | 2 | 1 |
| 8 | 07B61CI710 | COMPUTER NETWORKS LAB | 2 | 1 |
| 9 | 07B62CI704 | INFORMATION SYSTEMS LAB | 2 | 1 |
| 10 | 07B62CI705 | MULTIMEDIA DEVELOPMENT LAB II | 2 | 1 |
| 11 | 07B62CI706 | DATA MINING LAB | 2 | 1 |
| 12 | 07B61GE961 | INDUSTRIAL TRAINING | | 0 |
| | | **Total** | **37** | **28** |

**29**

**VII SEMESTER (B7)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - I | 3 | 3 |
| 2 | | DE-I | 3 | 3 |
| 3 | | DE-II | 3 | 3 |
| 4 | | DE-III | 3 | 3 |
| 5 | 08B72CI905 | PROJECT PART-I | 20 | 10 |
| | | **Total** | **32** | **22** |

## List of Electives for DE-I, DE-II and DE-III

| S.No. | Subject Code | Subject |
|---|---|---|
| 1 | 07B71CI401 | ARTIFICIAL INTELLIGENCE |
| 2 | 07B71CI402 | COMPUTER GRAPHICS |
| 3 | 07B71CI403 | DESIGN OF DATABASE SYTEMS |
| 4 | 07B71CI405 | MULTI-DIMENSIONAL DATA STRUCTURES |
| 5 | 07B71CI406 | NETWORK PROGRAMMING |
| 6 | 07B71CI409 | SOFTWARE ENGINEERING MANAGEMENT |
| 7 | 07B71CI410 | THEORY OF KNOWLEDGE, LEARNING, AND RESEARCH |
| 8 | 07B71EC403 | INFORMATION THEORY AND APPLICATIONS |
| 9 | 07B71EC404 | MOBILE COMMUNICATIONS |
| 10 | 07B72CI401 | ENTERPRISE APPLICATION DEVELOPMENT |
| 11 | 07B72CI402 | HUMAN COMPUTER INTERACTION |
| 12 | 07B72CI403 | MULTIMEDIA CONTENT AND ANIMATION DESIGN |
| 13 | 07B71PH401 | NANO SCIENCE AND TECHNOLOGY |
| 14 | 07B81MA406 | GRAPH THEORY |

**PD ELECTIVE - I**

| | |
|---|---|
| 07B71PD601 | ENTREPRENEURIAL DEVELOPMENT |
| 07B71PD602 | MANAGING AND MARKETING OF TECHNOLOGY |

**VIII SEMESTER (B8)**

| S.No. | Subject Code | Subject Title | Contact Hours | Credits |
|---|---|---|---|---|
| 1 | | PD– ELECTIVE - II | 3 | 3 |
| 2 | | DE-IV | 3 | 3 |
| 3 | | DE-V | 3 | 3 |
| 4 | | DE-VI | 3 | 3 |
| 5 | 08B82CI906 | PROJECT PART-II | 20 | 10 |
| | | **TOTAL:** | **32** | **22** |

## List of Electives for DE-IV, DE-V and DE-VI

| S.No. | Subject Code | Subject Title |
|---|---|---|
| 1 | 07B81CI415 | SYSTEMS PROGRAMMING |
| 2 | 07B81CI417 | IMAGE PROCESSING |
| 3 | 07B81EC407 | DIGITAL TV |
| 4 | 07B82CI404 | COMPUTER GAMES |
| 5 | 07B82CI405 | CRYPTOGRAPHY AND NETWORK SECURITY |
| 6 | 07B82CI406 | E-COMMERCE |
| 7 | 07B82CI407 | GEOGRAPHIC INFORMATION SYSTEMS |
| 8 | 07B82CI408 | HUMAN ASPECTS FOR INFORMATION TECHNOLOGY |
| 9 | 07B81MA408 | INTEGRAL TRANSFORMS |
| 10 | 07B81MA409 | PARTIAL DIFFERENTIAL EQUATIONS |

**PD ELECTIVE - II**

| | |
|---|---|
| 07B81PD109 | TOTAL QUALITY MANAGEMENT |
| 07B81PD108 | KNOWLEDGE MANAGEMENT |

# JUIT
# Outline Syllabi for B.Tech. Bio Informatics

**07B12BI101 METABOLIC NETWORKS**

Cell structure and function, Structure & properties of carbohydrates, proteins, lipids, Electron transport and oxidative phosphorylation, Metabolic strategies, Carbohydrate metabolism and regulation, Metabolism and regulation of nucleotides, fatty acids, amino acids, Integration of metabolism, Use of KEGG pathway database, Inborn errors in metabolism

**07B22BI102 STRUCTURAL BIOLOGY**

Protein structure (primary, secondary, super-secondary, domains, tertiary and quaternary structure), Ramachandran plot, covalent and non-covalent forces, protein secondary structure prediction, structural classification of proteins, nucleic acid structure and their types, protein-protein, protein-DNA and protein-RNA interactions, structure of membrane proteins, metalloproteins, 3D coordinate system, structure of viruses, protein folding , *in silico* protein engineering.

**07B31BT103 MICROBIOLOGY**

History of microbiology, Classification of microorganisms, Growth and physiology; Different methods of microbial enumeration, Microbial metabolism & photosynthesis, Fermentation, Anaerobic respiration, microbial genetics, Pathogenic microorganisms (bacteria, fungi, protozoa, and viruses, etc), Host-pathogen interactions, microbes in industry, extremophiles, bioprospecting of microbes,

**07B32BI103 BIOLOGICAL COMPUTATION**

DNA and protein sequences, Pairwise sequence alignment, Scoring schemes and their evaluations, Dynamic programming, EVD, Database search methods (BLAST, FASTA), Multiple sequence alignment (MSA), Local MSA, Markov model and hidden Markov model (HMM), Phylogenetic analysis, RNA structure analysis and algorithms for prediction of secondary structure of RNA, Comparative modeling of protein structure, and validation

**07B42BI104 MOLECULAR GENETICS**

Mendelian genetics, Cell division, Linkage mapping, Sex determination, Mutations and their role in Evolution, Population Genetics, Genetic Disorders, Central dogma of molecular biology, genetic code, DNA replication, Gene and genome structure and organization in prokaryotes and eukaryotes, molecular biology of transcription and translation; gene regulation, molecular mechanisms of recombination, transposons and rearrangement of DNA, DNA damage and repair, Post transcriptional and post-translational modification

**07B52BI105 MOLECULAR IMAGING & DESIGN**

Overview of protein structure & protein folding, protein structure determination by X-ray diffraction and NMR techniques, protein crystallization, structure validation, structural comparison and alignment, analysis of 3D structure, structure and functional assignment, protein structure prediction by homology and threading, *Ab initio* protein structure prediction, empirical force field, energy minimization, molecular dynamics, molecular simulation, image processing and pattern discovery

**08B52BT112 SCRIPTING LANGUAGES FOR BIOINFORMATICS**

JAVASCRIPT: Document object model, Elements of the document object model, accessing different objects of the HTML page, Dynamic page generation, programming using JavaScript; XML: DTD, xmlschemas, xml document structure, retrieving data from biological database in xml format; ASP: Asp code implementation using Perlscript, Objects used in ASP programming, database connectivity through ASP program; Perl CGI: Perl, bioperl, web programming using CGI interface; PHP: php programming( implementation of object model), Database connectivity using PHP and data retrieval.

**07B51BT109 GENETIC ENGINEERING**

Concepts in Genetic Engineering, Enzymes in Genetic Engineering, Cloning Vehicles, BAC / YAC vectors, Construction & screening of genomic libraries, gene cloning strategies, DNA sequencing & mutagenesis, Cloning & expression of transgenes in Prokaryotic & Eukaryotic systems, PCR technologies, gene transfer in plant and animals, molecular markers, Applications and impact of rDNA technology, Ethical issues and biosafety regulation

**07B51BT110 IMMUNOLOGY**

Basic immunology, types of immunity, T-cells and B-cells, Antigen-antibody Reaction, Cytotoxicity, Cellular and molecular aspects of antigens, antibody, structure, function and diversity, T-cell receptors, Regulation of Immune response and immunological tolerance, complement system, Autoimmunity, Hyper-Sensitivity, Tumor Immunity, Tissue and organ transplantation, MHC and HLA, Hybridoma technology, Immunity against infectious diseases, vaccines, immunodeficiency diseases, antibody engineering.

**08B62BT114 ADVANCED ALGORITHMS FOR BIOINFORMATICS**

Algorithms in the area of sequence assembly, gene prediction, sequence analysis, structure prediction and refinement, functional annotation of genes and proteins, refinements of multiple sequence alignment , structural alignment methods, mapping and comparison of metabolic pathways, and protein-protein and protein-DNA interactions using graph theoretic methods, and pattern recognition and matching in DNA and protein sequences

**07B61BT111 COMPARATIVE AND FUNCTIONAL GENOMICS**

Genes and Genomes, high throughput genome sequencing, model genomes, genome annotation, Phylogenomics, Haplotyping, SNP technologies, pharmacogenomics, proteomics, protein evolution, gene expression profiling, global gene cloning & expression platforms and technologies, microarrays (DNA, RNA, proteins), gene-knock out & silencing technologies, protein-protein interactions, MALDI-TOF MS, LC-MS MS, high throughput identification of biomarkers.

**07B62BI106 ADVANCED CHEMOINFORMATICS**

Defining chemical informatics, representing 2D structure, SMILES and SMARTS notation, 2D chemical database application, Database searching, representing 3D structure, molecular descriptors 2D & 3D, quantitative structure activity relationship, 2D & 3D QSAR in drug design, high throughput chemistry, pharmacophore, *de-novo* design system, computational model for ADME/toxicity, Artificial intelligence in chemical informatics.

**07B62BI107 MACHINE LEARNING FOR BIOINFORMATICS**

Intelligent systems, Hidden Markov model (HMM), Bayesian network (BN), Symbolic machine learning (Decision and identification trees), Application of Artificial intelligence (AI) for bioinformatics, Artificial neural network (ANN), Stochastic context free grammar (SCFG), Genetic & Lamarckian algorithms.

**07B62BI108 DRUG DESIGN TECHNIQUES**

Rational drug design, Molecular modeling of lead molecules, Three-dimensional structural databases, Target receptors, Receptor fitting and mapping, Pseudoreceptors, Role of solvents in computational calculations, Peptidomimetic design, Lead refinement, Properties of known drugs, ADME, Introduction to high throughput screening and clinical trials.

# Outline Syllabi for B.Tech. Bio Technology

**07B31BT101 THERMODYNAMICS AND CHEMICAL PROCESS**

Laws of thermodynamics, concept of entropy, Applications to compression and expansion processes. Solution thermodynamics - Excess properties of mixtures, Gibb's free energy, Gibbs-Duhem equation Chemical reaction equilibrium: Free energy and chemical reactions, equilibrium constant and its evaluation Phase equilibrium: Gibbs phase rule, fugacity as criterion of equilibrium, vapour-liquid equilibrium, completely miscible liquids. Thermodynamics of biomolecules Chemical Processes - Importance of chemical process calculations, Material Balances in Systems Involving Physical Changes and Chemical Changes, Energy balances for non reacting and reacting systems.

**07B31BT102 BIOCHEMISTRY**

Cell structure and function, Exploring biomolecules, Enzymes: Basic concepts and kinetics; Catalytic and regulatory strategies; Membrane structure and dynamics, Introduction to signal transduction cascades, Metabolic Energy: generation, storage and regulation strategies, metabolism & regulation of: carbohydrate, fatty acid, amino acid & nucleic acid, Metabolic disorders.

**07B31BT103 MICROBIOLOGY**

History of microbiology, Classification of microorganisms, Growth and physiology; Different methods of microbial enumeration, Microbial metabolism & photosynthesis, Fermentation, Anaerobic respiration, Pathogenic microorganisms (bacteria, fungi, protozoa, and viruses, etc), Host-pathogen interactions, microbes in industry, extremophiles, bioprospecting of microbes,

**07B41BT104 GENETICS**

DNA-the hereditary material, Cell division, Mendelian genetics & beyond Mendelism, Chromosomes and Chromosome theory of inheritance, Linkage, crossing over and mapping, Extra Chromosomal Inheritance, sex determination and sex chromosomes, Mutations and their role in Evolution, Population Genetics, Genetic Disorders**.**

**07B41BT105 CELL CULTURE TECHNIQUES**

Cell culture materials and tools, growth conditions and other requirements for establishment and maintenance of plant and animal cells, cell lines and tissues; *in vitro* conservation, protoplast & haploid culture, micropropagation, animal cell cultivation, primary culture, de-aggregation ,growth kinetics of cells in culture , Large scale production of biologicals in plant and animal cells, Stem cell technology and regenerative medicine.

**07B41BT106 MOLECULAR BIOLOGY**

Central dogma of molecular biology, nucleic acid structure: DNA and RNA, genetic code, DNA replication, Gene structure in prokaryotes and eukaryotes, Coding and Non coding DNA & RNA; molecular biology of transcription and translation; gene regulation, molecular mechanisms of recombination, transposons and rearrangement of DNA, DNA damage and repair, Post transcriptional and post-translational modification, Phage structure and biology.

**07B51BT107 INTRODUCTION TO BIOINFORMATICS**

Sequence retrieval and analysis, bioalgorithms, biological databases and their search, sequence alignment and construction of phylogenetic trees, Gene predictions, RNA and protein structure prediction, Use of bioinformatics tools in biotechnology biopharma.

**07B41BT301 GLP & INSTRUMENTATION**

Historical background of GLPs, Organization and personnel, Animal care facilities, Separation and isolation of animals, Animal supply facilities, Facilities to handle test articles and control articles, Specimen / data storage. Testing facilities operation, Safety in the Laboratory, Material safety, Environmental safety, and Occupational hazardous safety management. Waste management and disposal, Emergency care, First aid in accidents and poisoning, Conduct of non-clinical studies, Theory, instrumentation and applications of Visible, UV, IR, NMR and MS spectroscopy, Centrifugation: Types of centrifugation techniques Centrifugation: Rotors, Tubes, Gradient materials, Fermenter, Chromatography Electrophoretic techniques: PAGE, isoelectric focusing, DNA Agarose, Analysis by Gel Doc, Radio isotope techniques: Detection and measurement of radioactivity, Geiger Muller counters, Scintillation counting, Autoradiography and RIA

**07B51BT108 PROCESS ENGINEERING**

Microbial process development, Bioreactor systems including utilities, Fluid flow and mixing - Flow behavior, mixing, power consumption and shear properties of rushton turbine, helical, anchor, bubble column, external loop, airlift etc. Heat transfer – different modes of heat transfer, design equation for maximum biomass production, Mass transfer in microbial processes, Modes of culture – batch, fed batch, continuous, recycle. Fluidized bed bioreactors and immobilized bioreactors, Scale up of microbial processes with case studies related applications in various biotech and biopharma industries

**07B51BT109 GENETIC ENGINEERING**

Concepts in Genetic Engineering, Enzymes in Genetic Engineering, Cloning Vehicles, BAC / YAC vectors, Construction & screening of genomic libraries, gene cloning strategies, DNA sequencing & mutagenesis, Cloning & expression of transgenes in Prokaryotic & Eukaryotic systems, PCR technologies, gene transfer in plant and animals, molecular markers, Applications and impact of rDNA technology, Ethical issues and biosafety regulation

**07B51BT110 IMMUNOLOGY**

Basic immunology, types of immunity, T-cells and B-cells, Antigen-antibody Reaction, Cytotoxicity, Cellular and molecular aspects of antigens, antibody, structure, function and diversity, T-cell receptors, Regulation of Immune response and immunological tolerance, complement system, Autoimmunity, Hyper-Sensitivity, Tumor Immunity, Tissue and organ transplantation, MHC and HLA, Hybridoma technology, Immunity against infectious diseases, vaccines, immunodeficiency diseases, antibody engineering.

**08B61BT113 DIAGNOSTICS AND VACCINE MANUFACTURE TECHNOLOGIES**

General Information/Introduction, Collection and shipment of diagnostic specimens, Biosafety and biosecurity in the veterinary/medical microbiology laboratory and animal facilities, Quality management in veterinary/medical testing laboratories, Principles of validation of diagnostic assays for infectious diseases, Validation and quality control of polymerase chain reaction methods used for the diagnosis of infectious diseases, Laboratory methodologies for bacterial antimicrobial susceptibility testing, Biotechnology in the diagnosis of infectious diseases and vaccine development, Principles of veterinary vaccine production, Tests for sterility and freedom from contamination of biological materials, Guidelines for international standards for vaccine banks, The role of official bodies in the international regulation of veterinary biologicals, Recent developments in vaccine technology.

**07B61BT111 COMPARATIVE AND FUNCTIONAL GENOMICS**

Genes and Genomes, high throughput genome sequencing, model genomes, genome annotation, Phylogenomics, Haplotyping, SNP technologies, proteomics, protein evolution, pharmacogenomics, gene expression profiling, global gene cloning & expression platforms and technologies, microarrays (DNA, RNA, proteins), gene-knock out & silencing technologies, protein-protein interactions, MALDI-TOF MS, LC-MS MS, high throughput identification of biomarkers.

**07B61BT112 FOOD AND AGRICULTURAL BIOTECHNOLOGY**

Biotechnological strategies for producing specific food ingredients, nutraceuticals and functional foods, Single Cell Proteins, Probiotics, Biotechnological approaches in production of therapeutics & industrial products in animals and plants, Food processing and engineering technologies, Biotechnology and Food security**.**

**07B61BT113 CELL AND DEVELOPMENTAL BIOLOGY**

Biology of cell organelles and cytoskeleton, Membrane transport, Regulation of cell cycle and cell death, Principles of developmental biology, developmental mutants, transgenic organisms in development, Genes in development, unicellular models: *Dictyostelium discoideum*, multicellular models: *C. elegans*, Drosophilla, Chick, *Mus musculus*, *A. thaliana*, Vertebrate limb & organ development.

**07B61BT114 FERMENTATION AND DOWN STREAM PROCESSING**

Modes of Cell Culture – mathematical modeling of batch, fed batch, continuous, recycle continuous culture, Cell Growth Kinetics, Operating, Considerations for Bioreactors for Suspension and Immobilized Cultures, Enzyme kinetics for fluidized and immobilized enzymes, Bioprocess Considerations for animal and plant cell culture. Different modes of sterilization (batch, continuous), rate of nutrient degradation, Theory of depth filters, mixed cultures, high throughput and industrial scale purification and recovery of end products

**BT/BI ELECTIVES**

**07D41BT428 ANTIBODY ENGINEERING AND MANUFACTURING TECHNIQUES**

Antibody structure and function; Traditional methods for antibody productions; Human antibodies; Selecting and screening recombinant antibody libraries; Regulatory issues for the development of antibody therapeutics; Patents related to antibodies; Manufacture of antibodies; Engineered antibody fragments and the rise of single domains; Arming antibodies: prospects and challenges for immuno-conjugates; Monoclonal antibody therapy of cancer and diseases; Recombinant antibodies in the clinic

**08B71BT435 BIO-ENERGY TECHNOLOGY**

Introduction, Biomass and Lignocellulosic Ethanol, Biomass Gasifier and Biogas, Radical Options For Bioenergy Technology, Economics, Use and Environmental Aspects, Energy and Environmental Policies

**07B71BT418 BIOTERRORISM**

Historical perspectives, Dangers of biowarfare/terrorist acts ; Estimates of socioeconomic impact; Biological agents employed against plants and animals; Anti-human Biological Agents - Types and Characteristics; Anthrax, Plague, Tularemia, Q fever, Smallpox, Viral hemorrhagic fevers, Viral equine encephalitis, Botulism, Ricin, Staphylococcus entertoxin B (SEB) (Diagnosis, treatment prevention, control and potential use as bioweapon); Bioethics and prevention of the misuse of biological sciences; Other possibilities

(Future concern)

**07B81BT419 CANCER BIOLOGY**

The elective course is designed for students interested in learning about the molecular and cell biology of cancer and how this knowledge is being applied to the prevention, diagnosis and therapy of cancer. Topics covered include tumor pathology and epidemiology; tumor viruses and oncogenes; intracellular signaling; tumor suppressors; multi-step carcinogenesis and tumor progression; genetic instability in cancer; tumor-host interactions; invasion and metastasis; tumor immunology; cancer therapy.

**07B71BT404 CLINICAL TRIALS AND DATABASE MANAGEMENT**

This course is designed for individuals interested in the scientific, policy, and management aspects of clinical trials. Topics include types of clinical research, study design, treatment allocation, randomization and stratification, quality control, sample size requirements, patient consent, and interpretation of results. Students design a clinical investigation data base in their own field of interest

**08B81BT436 FERMENTED FOOD PRODUCT TECHNOLOGY**

Introduction: Microbiology and biochemistry of fermentation; Composition and nutrition of fermented products; Sensory evaluation of fermented foods; Bioreactors in Food fermentation; Packaging of fermented food products; Economics of fermented products; Case studies: Oriental fermented food, Fruit-based alcoholic beverages, production of single cell proteins, Fermented meat products, fermented fruits and vegetables

**07B71BT434 FUNCTIONAL FOOD TECHNOLOGY**

Introduction to function food, Physiological targets of functional food- Anti obesity functional food, Influence of diet on aging and longevity, food and food components in prevention of cancer; Biotechnology strategies for producing specific food ingredients: prebiotics from lactose, dextran and glucooligosaccharides, proteins and peptides; Probiotics: genomics of Lactic acid bacteria an its impact on functional food; Current research trends in functional food technology: bakery products, grains, beta-glucan, herbal tea, seaweeds, pectin, rutin, synbiotics from carrot juice; Technologies use in functional food**:** Encapsulation method; Nutrigenomics, Consumer issues of functional food

**07B72BI406 HIGH THROUGHPUT SCREENING TECHNIQUES**

Defining high throughput screening techniques and their applications, Microarray and high throughput screening of genes: general protocols, types, fabrication and printing of microarray, hybridization, image segmentation, data acquisition, data normalizations, analysis and clustering; Protein array and high throughput screening of proteins,

Screening and annotation of genes and proteins based on in Silico approaches, Structure and ligand based approaches of screening of lead molecules.

**07B71BT433 INDUSTRIAL PLANT TISSUE CULTURE**

Plant tissue culture/Micropropagation at a glance, Designing commercial tissue culture Units, various routs and stages of micropropagation, Cost reduction and scale up of commercial micropropagation, New innovations to make commercial micro propagation efficient, Industrial Production Phytochemiclas, Secondary metabolites through plant cell cultures.

**07B81BT424 MANUFACTURING PROCESSES & QC**

Introduction to Product development in pharmaceutical company, process development, Operation & System, Formulation development and Regulatory affairs involved in pharmaceutical industry; Manufacturing steps in pharmaceutical industry: discovery of biopharmaceuticals, Initial Product characterization, Unit operations in the production of biopharmaceutical, Final product formulation, Product analysis; Manufacturing processes in food industry-Beverage Industry; Manufacturing processes in food industry- Dairy:

**07B72BI402 MICROBIAL GENOMICS**

Introduction to Microbial world; Microbes of Importance to Environment, Health, Energy, Agriculture, and Industry; Microbial Genetics: Bacteria, Fungi, Viruses, etc.; Organization of Microbial Genomes; Microbial Genome Sequencing and Analysis; Case Studies of Selected Bacteria and Fungi; Microbial Genome Databases; Bioinformatics Tools for Comparative Genome Analysis; Genome Evolution; Genome Engineering (reduced genome; pathway engineering; Genome transplantation in bacteria); Microbial Genome Arrays; Microbial bio-prospecting: Industrial Sectors, Markets, and Strategies; Extremophiles: Genomics for Discovery of Novel Genes and Metabolites; Metagenomics: Technologies and Applications; Microbial e-Cell: Concept and Applications; Functional Genomics of Microbes: Technologies and Applications

**08B71BT432 MOLECULAR ASPECTS OF LIFE STYLE DISEASES**

Introduction: concept of health and wellness: seven dimensions of health and its relationship to positive life style; Major life style diseases: cardiovascular diseases, hypertensions, obesity, type 2 diabetes, renal disorder, osteoporosis, cancer, altherosclerosis, Alzhimer's disease: Molecular basis, related risk factors and preventive strategies; Sexually Transmitted disease; Diseases associated with smoking, alcohol and drug and substance abuse; Stress related disorder; Nutritional habits and their impact on health; Complete health concerns: consumer education/ awareness and life style impact

**07B71BT409 MOLECULAR DIAGNOSTICS**

Nucleic acid extraction and hybridization, target, signal and probe amplification; micro-arrays and *in-situ* hybridization detection topics addressed in the context of organisms genome and common mutation detection; Molecular applications in oncology, forensics, paternity, transplantation and infectious diseases; Quality assessment, regulatory and ethical issues in molecular testing; performance of basic techniques used in molecular testing. Nucleic acid extraction, quantization, digestion, hybridization, amplification by PCR, electrophoresis, real-time PCR, DNA fingerprinting and FISH analysis, emphasis on interpretation of results and quality control; Research Design and Method Evaluation: Giving an overview of research design and methods commonly used in laboratory validation for molecular assays. Measurement issues affecting research and clinical practice, application of statistical procedures in research design; identifying resources for method validation; analysis and clinical validation of molecular tests.

**08B81BT433 PLANT GENETIC ENGINEERING**

Plant transformation technology, Transgene stability and gene silencing, Application of Plant genetic engineering for agronomic and quality traits, Chloroplast Transformation: advantages, vectors. Marker free transformation, Use of RNAi in plant metabolic engineering, Recent advances in metabolic engineering of pants for biotic and biotic stress, yield enhancement, production of secondary metabolites and other useful products.

**07B81BT426 PROTEIN ENGINEERING AND APPLICATIONS**

To impart understanding of the basis of protein folding and stability in order to design mutations to modify protein structure, stability and function. Topics include: Introduction to protein engineering **,** Molecular Evolution Combinatorial Methods, Phage display and related methods, Methods of random mutagenesis, Expression of proteins in different systems, Engineering to improve purification processes, Applications of protein engineering

**07B71BT414 STEM CELLS AND HEALTHCARE**

This is an optional subject in which students will be acquainted with the general characteristics of various kinds of stem cells and the mechanisms by which they carry out their functions and the ethical consideration facing this research field would be discussed. Topics covered include stem cell categories,sources isolation ,signaling, role in regenerative medicine stem cell banking and guidelines pertaining to stem cell research in India and abroad.

**08B81BT431 STRESS PROTEINS IN MEDICINE**

This course will provide an insight into the various roles of stress proteins in medicine. Topics include: Overview of the structure and function of stress proteins, Stress Proteins as Molecular Chaperones, Clinical Implications of the Stress Response, Stress proteins in

aging and disease,Stress Proteins and Expression in Diseased Tissue, Stress Proteins and Specific Immune Responses, Heat shock proteins as emerging therapeutic targets

**07B72BI401 SYSTEM BIOLOGY**

System biology approaches, genetic network analysis, system discovery, modeling complex biological system, metabolic pathway analysis, Mass/Flux balance analysis, simulation of regulatory pathways, system approaches to metabolic networks, protein-protein interaction networks, Biocitcuits: blocks and designing, case studies, E-cell project and applications in drug testing a case study

**08B81BT430 VACCINE MANUFACTURE**

Biotechnology in the diagnosis of infectious diseases and vaccine development * Principles of veterinary vaccine production * Tests for sterility and freedom from contamination of biological materials * Guidelines for international standards for vaccine banks * The role of official bodies in the international regulation of veterinary biologicals * Recent developments in vaccine technology * Different types of vaccines, i.e., sub-unit vaccines, recombinant vaccines, synthetic vaccines, idiotypic based - vaccines, DNA vaccines, glycoconjugate vaccines, deletion vaccines * Genetic basis of attenuation, vaccine vectors, large-scale production of vaccines and automation * Vaccine delivery system and approaches to enhance immunogenecity immunomodulators and, immunomodulation adjuvants * Delivery of particulate antigens through liposomes, microsheres, protein cocheleates * GMPs and quality control of conventional *vis-à-vis* recombinant vaccines.

# Outline Syllabi of the Pharmacy Subjects

## B. PHARM
## SEMESTER B1

**07B11PD301 PRESENTATION AND COMMUNICATION SKILLS**

Communication process and barriers. Listening skills. Speaking skills – phonetics, stress, rhythm and intonation, linguistic and Para-linguistic skills, content organization and coherence. Reading skills – intensive and extensive reading, SQ3R technique, vocabulary, morphology. Writing skills – clear writing, abridgment, précis writing, letters, circulars, agenda, minutes, report. Presentation skills.

**07B11PD302 ENGLISH (Audit Course)**

Functional english grammar - tenses, voice, punctuation, concord, direct-indirect speech, common errors in sentences. Vocabulary – commonly confused and misused words, synonyms, antonyms, spelling, homophones, one word substitute. Comprehension. Conversational skills – interactive sessions. Compositions - paragraph writing, story writing, dialogue writing, letter writing, message, notice.

**08B11PY101 BASIC BIOLOGY**

History of Biology, Evolution, Speciation and Selection, Taxonomy, five kingdoms of living organisms, Cell fractionation, cell organelles, and cellular organization, Osmosis, diffusion, active transport, Biomolecules and their analysis, Growth and Development with emphasis on human development, Transport, co-ordination and control , movement and support, homeostasis in humans, Genetics, Heredity and population genetics, Mutations and their role in Evolution.

**08B11MA108 BASIC MATHEMATICS -I**

Module 1: Relation and functions

Module 2: Complex numbers

Module 3: Differential Calculus and integral complex

Module 4: Matrices and determinants

Module 5: Two dimensional coordinate geometry

**08B11PY102 GENERAL PHARMACY**

Module 1: Pharmacopoeias

Module 2: Metrology and calculations

Module 3: Dosage forms

Module 4: Galenicals

Module 5: Surgical aids and incompatibilities

**08B11PY103 PHARMACEUTICAL INORGANIC CHEMISTRY**

Module 1: Pharmaceutical chemicals; Purity and management

Module 2: Pharmacopoeial substances

Module 3: Pharmaceutical aids

Module 4: Radiopharmaceuticals

**07B11CI101 INTRODUCTION TO COMPUTERS AND PROGRAMING**

Computer applications. Basic computer architecture. Programming language hierarchy. Program translation and execution. Algorithms, Pseudo codes and flowcharts. Program design and Basic software development life cycle. Program as State machine. Basic testing and debugging. Number system. Character & Instruction representation. Data types. User interaction. Structured programming. Selection. Control flow. Looping control structu re. Arrays and strings. Pointers. Functions. Structures. Unions. Enumerations. Preprocessor. Iteration. Recursion. Dynamic memory allocation. Linked -lists. File I/O. Simple graphics and multimedia operations. C Libraries. User defined header files.

# B. PHARM
# SEMESTER B2

**07B21PD102 GROUP AND CO-OPERATIVE PROCESSES**

Group – behavior, development, structure and processes. Teams – types and contemporary issues. Individual - personality, learning, perception, values, att itudes and job satisfaction. Assertiveness - communication styles, self expression, social boldness. Emotional intelligence. Transactional analysis - ego states, life positions, transactions, stroking. Motivation. Leadership. Conflict and negotiation.

**08B21PY104 HUMAN ANATOMY AND PHYSIOLOGY**

Module 1: Anatomy and physiology of Upper Limb, Thorax, Lower limb, Abdomen and Pelvis.

Module 2: Neuro Anatomy and physiology; Control Systems of Human Body.

Module 3: Haemodynamics, Homeostasis, Development and Inheritance.

**08B21PY105 PHARMACEUTICAL ORGANIC CHEMISTRY-I**

Module 1: Nomenclature of organic compounds; Structure and Physical Properties

Module 2: Aliphatic Hydrocarbons and derivatives

Module 3: Aromatic Hydrocarbon and derivatives

**08B21PY106 PHYSICAL PHARMACY**

Module 1: Physical properties of drug molecules

Module 2: Surface and interfacial phenomenon

Module 3: Kinetics and Drug stability

Module 4: Micrometrics and Powder Rheology

Module 5: Complexation and Dispersion system

**08B21MA109 BASIC MATHEMATICS –II (Tentative )**

Module 1: Sequences and Series

Module 2: Coordinate Geometry and Vectors

Module 3: Calculus of two or more variables, Differential Equations

Module 4: Probability and Statistics.

Module 5: Numerical Methods.

# Outline Syllabi for Civil Engineering

**07B21CE101 ENGINEERING MECHANICS**

Introduction and application of Equivalent force system and equations of equilibrium. Basic concept of force - couple system, planar force system, parallel force system, general force system, Analysis of pin jointed frames, Friction and its application, Kinematics of particle and rigid body, Dynamics of particle and rigid body, Virtual work, Impulse and Momentum, Centroid & center of gravity, Moment of inertia Mechanical Vibrations: Introduction, Equations of motion for single degree of freedom system, free and forced vibrations and damped vibrations. Compound springs with linear motion.

**07B21CE701 WORKSHOP PRACTICE**

Carpentry Shop, Wood Working tools, Fitting Shop, Welding Black Smithy Shop Introduction to forging and forging methods heating metals for forging. Foundry: Pattern Making Moulding**.**

**07B31CE101 MECHANICS OF SOLIDS**

Simple stresses and strains: Stress-strain relationships, elastic constants and their relationships, temperature stresses. Analysis of axially loaded members: Bars of uniform, varying and tapering cross sections, composite bars.

Complex Stresses: Stresses on inclined planes, principal stresses and strains, Mohr's circle of stresses, theories of elastic failure.

Simple theory of bending, bending and shear stress distributions in beams

Bending moment and shear force diagrams, relationships between loads, shear force and bending moment.

Slope and deflection of beams: Differential equation of the deflection curve, double integration method, Macaulay's method, moment area method and conjugate beam method.

Torsion in circular shaft

**07B31CE102 FLUID MECHANICS**

**Introduction**; Definition, Types of fluid, Properties of fluid, Fluid pressure on curved & plane surfaces, Pressure measurement, Stability of floating bodies.

**Kinematics of fluid flow;** steady & unsteady, uniform & non-uniform, rotational & irrtotational, laminar & turbulent flow, Continuity equations for 1-D & 2-D flows, Flow-nets.

**Dynamics of fluid flow;** Euler's equation, Bernoulli's equation; Venturimeter, Pitot-tube, Orifice-meter, Notches & Weirs, Mouthpieces, Impulse-momentum equation, Dimensional analysis & modelling criteria.

**Boundary Layer Theory**; Elements of boundary layer theory. Drag & lift Airfoil theory.

**Analysis of pipe flow**; Laminar & Turbulent flow through pipes & velocity distribution, Darcy-Weisbach's equation, Losses in pipe sections, branching of pipes.

**07B31CE702 FLUID MECHANICS LABORATORY**

List of Experiments:

1. Determination of metacentric height
2. Calibration of a venturi meter
3. Determination of frictional losses in pipes of different diameters.
4. Determination of minor losses in pipes
5. Calibration of pitot-tube
6. Calibration of a, v- notch and rectangular notch
7. Reynolds dye experiment for flow characterization
8. Determination of $C_c$, $C_v$ and $C_d$ of an orifice
9. Verification of Bernoulli's theorem
10. Calibration of orifice meter
11. Verify the impulse momentum equation (impact of jet)
12. Performance characteristics of a centrifugal pump
13. Valve characteristic

**07B31CE701 ENGINEERING GRAPHICS AND CAD APPLICATIONS**

Introduction: Drawing Instruments and use, Letter writing, Geometrical configurations, Scales

Conic Sections
Orthographic Projections: Points, straight lines, planes, simple solids
Isometric Projections: Simple solids like cube, cylinder, prism, cone
Orthographic projections of simple machine elements like machine clamp, dovetail brackets and bearing block.
Development of Surfaces
Applications Of AutoCAD Software:
Basic terminology, Drawing commands and skills, Project Planning, 3-Dimensional drawing, Advance Tools: Template files, object snap in AutoCAD, line types, file formats, editing and modifying, Inquiry tools, X-Rays in CAD, System variables

**07B41CE101 STRUCTURAL ANALYSIS**

Introduction: Statically determinate & indeterminate structures.
Analysis of statically determinate structures: trusses, frames, and three hinged arches

Strain energy due to axial, bending, shear and torsion loads, Castigliano's theorem, Maxwell-Betti's theorem, Principal of virtual work, reciprocal theorem, and principle of superposition.
Analysis of plane redundant frames up to two degree of redundancy by energy method, slope deflection method and moment distribution method
Analysis of propped cantilever, fixed beam, continuous beam, and Clapeyron's three-moment theorem
Two hinge and fixed arches
Buckling of columns, critical loads, axially and eccentrically loaded columns
Rolling loads and Influence lines for beams

**07B41CE102 GEOTECHNICAL ENGINEERING**

Introduction to Geo-technical problems in Civil Engineering
Soil types and formation, simple soil properties, grain size distribution, Atterberg's limits, soil identification and I.S. classification.
Total, effective and neutral stresses, Darcy's law, permeability and capillarity of soil, seepage, flow- nets, Piping, filters and filter design.
Laboratory compaction and field compaction of soils
Stress distribution in soils under surface loadings.
Compressibility, one-dimension consolidation, simple settlement analysis
Shear strength, total and effective strength parameters and their determination.
Earth pressure: Classical theories, graphical charts
Stability of slopes

**07B41CE103 SURVEYING**

Introduction: Classification of surveying, Principle of surveying. Error due to use of wrong scale.
Chain Surveying: Instruments for chaining, Errors due to incorrect chain, Chaining on sloping ground, Errors in chaining, Tape corrections, Chain triangulation, setting out right angles, Basic problems in chaining, Conventional symbols used in chaining..
Compass Surveying: Instruments (Prismatic & Surveyor compass), Bearing and angles, Magnetic declination, Local attractions, errors in compass survey
Leveling: Instruments, Optical defects in lenses, Temporary adjustment of a level, Direct leveling, Differential leveling, Reciprocal leveling, Curvature & Refraction corrections, Leveling problems, Errors in leveling, The level tube trigonometrical leveling .
Contouring: Contours, Contour interval, Contour gradient, Characteristics of contours, Methods of locating contours & their interpretation, Uses of contour maps. Calculation of areas& volumes. Planimeter, minor instruments.
Theodolite: Transit & Non-transit, Definition & terms, Measurement of horizontal & vertical angles, Fundamental lines of the theodolite and desired relationships, Sources of error.
Traverse Surveying: Methods of traversing, Traverse computations, closing errors, Balancing the traverse, Omitted measurements.

Plane Table Surveying: Instruments, Principle & methods of plane tabling, Three-point problem, Two-point problem, Errors in plane tabling, Advantages & disadvantages.
Tachometric Surveying: Instruments and Tachometric methods.
Curves: Simple circular, Compound, Reverse & Transition curves, setting out of the curves.
Photographic Surveying: Principles, Advantages of Aerial photography.
Setting Out Works: Buildings, Culverts, Bridges, Tunnels, Transferring levels underground.
Introduction to Remote Sensing, GPS, GIS and Map study

**07B41CE104 ENGINEERING MATERIALS**

Soil: Application as construction material, strength & compressibility characteristics
Stones: Commonly used stones, composition, engineering characteristic & uses.
Bricks: Classification, specification, ingredients, qualities & manufacture of bricks.
Aggregates: Classification, characteristics, soundness, alkali-aggregate reaction.
Lime: Sources of lime, physicochemical properties, manufacture, application.
Cement: Raw materials, types; Portland, Pozzolanic and slag cements, physicochemical properties of Portland cement, hydration, setting, hardening and curing, manufacture of Portland cement.
Concrete: Properties of fresh concrete, mechanical properties of concrete, concrete additives, introduction to mix design.
Steel: Microstructure and mechanical properties (ductility, durability and strength) of mild steel, cold worked steel, effect of temperature, anti rusting treatment of steel, bitumen & polymer treatments.
Wood: Structure of tree, types, seasoning, decay, disease, defects, preservation.
Plastics & Polymers: Uses as building material.
Other Materials: Glass, Paints, Varnishes, Bitumen, Asbestos and Geosynthetics

**07B41CE703 SURVEYING LAB**
**List of experiments:**

1. Chain survey
2. Compass survey
3. Plane table survey
4. Simple leveling
5. Profile leveling
6. Longitudinal & Cross section
7. Contouring
8. Theodolite
9. Tachometry
10. Areas & Volumes
11. Traversing
12. Trigonometric leveling.
13. Total station

**07B41CE702 GEOTECHNICAL LAB**

**List of Experiments:**

1. Field Identification Test
2. Specific Gravity of soil particles by Pycnometer bottle.
3. Specific Gravity of soil particles by Density bottle method
4. Particle size distribution of soils (Grain size analysis) by Sieve analysis for course-grained soils
5. Particle size distribution of soils (Grain size analysis) by Hydrometer analysis for fine grained soil
6. Determination of Atterberg's limits (Consistency limits) for Non Swelling type soils
   a) Liquid Limit b) Plastic Limit c) Shrinkage limit
7. Determination of Atterberg's limits (Consistency limits) for Swelling type soils
   a) Liquid Limit b) Plastic Limit c) Shrinkage limit
8. Determination of density of soils by Core cutter method
9. Determination of density of soils by Sand replacement method
10. Determination of density of soils by Water displacement method
11. Determination of permeability of soils by Variable head method
12. Determination of permeability of soils by Constant head method
13. Soil compaction test (Density moisture relations)
14. Determination of Moisture Content and its variation with drying duration
15. Determination of moisture content by rapid moisture meter

**07B41GE101 ENVIRONMENTAL STUDIES**

The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, Biogeochemical cycles.

Natural resources, their consumption & Protection: Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Role of an individual in conservation of natural resources, Equitable use of resources.

Pollution- a threat to environment: Air, Water & Land pollution, sources & causes, Space pollution, causes & effects, toxicity limits of pollutants. Critical issues concerning global Environment (Urbanization, population growth, global warming, climate change, acid rain,

ozone depletion etc.) and the Roots in: Cultural, Social, Political, Commercial, industrial, territorial domains.

**07B51CE102 DESIGN OF CONCRETE STRUCTURES**

Introduction to the design of Concrete structures;
Working & Limit state concepts.
Limit state Analysis; Design of beams for flexure, bond, shear and torsion (singly & doubly reinforced, T-beams & L-beams);
Axially and eccentrically loaded Columns; One and two-way Slabs, Stair cases; Footings, isolated and combined; Retaining wall;

**07B51CE101 HIGHWAY ENGINEERING**

Importance of transportation, different modes, characteristics & Scope of highway engineering in India,
Highway development in India, classification of roads, planning surveys, highway planning in India.
Highway alignment, engineering surveys, drawings and report, realignment.
Geometric design: Introduction cross section elements, sight distance, design of horizontal and vertical alignment of highways.
Traffic Engineering: Introduction, characteristics, traffic operation. , design of intersections, parking facilities, and lighting, traffic planning.
Highway materials: sub grade soil classification, evolution of soil strength, modulus of sub grade reaction, C.B.R test, tests for road aggregate, types of bituminous materials, tests on bitumen. Bituminous paving mixes, marshal method of mix design,
Pavement Design: types of pavements, design factors, design of flexible pavements by G.I method, C.B.R. method, Burmister's method, design of rigid pavements by using I.R.C.Recommendations.
Highway construction: construction of earth roads, gravel roads, W.B.M. roads, bituminous roads, and Cement concrete pavement, joints in concrete pavement.
Highway maintenance: Flexible &rigid Pavement failures, maintenance of bituminous surfaces,& cement concrete pavements, strengthening of existing pavements, overlay design by Benkelman beam deflection studies. Surface &sub surface Drainage of pavements.

**07B51CE103 DESIGN OF HYDRAULIC STRUCTURES**

**Open channel flow;** Steady state flow, Uniform flow, Critical flow, Analysis of Rapidly Varied Flow & Gradually Varied Flow, Hydraulic jump, Channel transitions

**Diversion Head Works;** Weirs and Barrages - Layout of a diversion Head work and its components - Failures of hydraulic structures founded on pervious foundations - creep theory for seepage flow - (Bligh's Lacey's and Khosla's)

**Storage works;** Design of gravity dams : modes of failure and criteria for structural stability of gravity dams - Diversion problems in dam - construction of Galleries - joints – foundation treatment - Types of earthen dams - methods of construction - Causes of failure of earthen dams , Seepage Analysis - seepage control in Earthen dams.

**Spillways;** Spillway types, control concepts, overflow, side channels, shaft and siphon spillways, chutes, cavitations, aeration

**Maintenance of Hydraulic structures;** Types, procedure, charts, Annual maintenance.

**07B51CE104 CONSTRUCTION TECHNOLOGY AND MANAGEMENT**

Introduction to various operations in construction, execution and management Standard and special construction equipments, heavy earthmoving equipments, shovels and cranes, crushing plant, batching plant, bitumen plant
Techniques and equipments for concreting, tunneling, road pavement, dewatering, drilling, blasting and grouting
Selection of construction equipment, cost of owning and operating, capacity and utilization, breakdown analysis, economic life, replacement of equipment and sinking fund
Form works, their design, fabrication and uses
Uses and design of scaffoldings
Steel constructions; fabrication and erection techniques

**07B51CE701 HIGHWAY ENGINEERING LAB**

**List of experiments:**

1. Aggregate crushing strength test.
2. Los angeles abrasion test.
3. Aggregate impact test.
4. Flakiness index & elongation index test.
5. Penetration test.
6. Ductility test.
7. Viscosity test.
8. Softening point test.
9. Flash &fire point test.
10. Determination of bitumen content by centrifuge extractor.
11. Determination of marshal stability value.
12. Determination of rebound deflection of pavement by Benkelman beam.

## 07B51CE702 CONCRETE TECHNOLOGY LABORATORY

**List of Experiments:**

1. To determine the quantity of water for cement paste for normal consistency
2. To determine initial and final setting time of cement
3. To determine the fineness, specific gravity and unit weight of cement
4. Determination of tensile and compressive strength of cement
5. To determine fineness modulus of fine and coarse aggregate
6. To determine compressive strength of nominal mix concrete of a given grade
7. To determine the modulus of rupture of concrete
8. Workability of concrete by various methods
9. To determine the split tensile strength of concrete of given mix proportions
10. To determine the percentage bulking of fine aggregate
11. To determine soundness of given cement by Le-Chatelier method
12. Effect of water cement ratio on strength of concrete

## 07B51CE703 COMPUTER AIDED PLANNING AND COSTING

Planning of Residential, Commercial, Educational and Hospital buildings by considering different aspects like .site , climatic, utility, Vastu & architectural, financial etc, municipal town planning rules &regulations,
The Units of measurements and payments for various items of works and materials Methods of estimating, estimating steps, estimating of buildings, different types of roofs, sanitary and water supply works, road works, culverts, bridges, wells, and irrigation works,
Types of estimates: preliminary and detailed estimates, contingencies, administrative approval,
Analysis of rates; factors affecting the rate analysis, material and labour requirements for different types of work, rates of materials & labour. Estimate the unit rate for different items.
Estimating of quantities of materials and transport,
Specifications, rules and methods of measurement.

Autocad/3 D home: Draw the plan, elevation, section and views of different civil engineering structures by using 3D home/AutoCAD software and check the estimation done manually by using MS-Excel.

Drawing work: Plan, elevation, section and views of residential buildings, different types of roofs, sanitary and water supply works, road works, culverts, bridges, wells, and irrigation works etc.

**08B51CE105 WATER SUPPLY ENGINEERING**

**Course Outline:**
Introduction: Importance of planned water supplies; financing, planning and execution of modern water supply schemes.

Water demands: Various types of demands; the per capita demand: variations in demand; design periods; population forecasting by various methods.

Sources of water: Kinds of water sources and their characteristics; factors governing the selection of a source of water supply; storage capacity of impounded reservoir.

Quality of water: physical, chemical and biological characteristics of water, common water born diseases, standards of purified water for various purposes.

Treatment of water: screening and types; aeration units; sedimentation; sedimentation tanks and their types; sedimentation aided with coagulation; classifications of filters and their constructional and operational details.

Disinfection: Methods of disinfection; chlorination and its types.

Water softening: Importance of water softening; lime- soda process; Zeolite process.

Miscellaneous treatment methods: Removal of colour, odour and taste, iron and manganese; fluoridation and defluoridation.

Collection and Distribution of water: Intakes and their design for lakes, streams and rivers; methods of distribution; concept of service and balancing reservoirs; capacity of distribution reservoirs; Design of water distribution systems; analysis of pipe networks by Hardy Cross method, equivalent pipe method, method of sections and Newton-Raphson method; Layout of distribution system; the house water connection; construction and maintenance of distribution systems.

Pipes-Joints-Fittings: various types of conduits; testing and inspection; joints in pipes; valves in pipe line.

Pumps and pumping stations: Types of pumps and their choice; pumping stations; economical diameter of rising main; hand pumps; pump testing; Water hammer and its control measures.

Planning and preparing water supply projects.

**08B51CE705 ENVIRONMENTAL ENGINEERING LAB-1**
**List of experiments:**

1. To determine *pH*, *turbidity,* electrical *conductivity* of the given sample.
2. To determine the *acidity* and *alkalinity* of the given water sample.

3. To estimate the content of *chlorides* in the given water sample.
4. To determine the *total hardness*, calcium and magnesium in the given sample.
5. To find the amount of S*ulphates* in the given water sample.
6. To determine the *Fluoride* in the given water sample.
7. To find out *Nitrate nitrogen* present in a given water sample.
8. To determine the optimum *coagulant dose* quantity for given sample of raw water.
9. To determine chlorine demand and residual chlorine.
10. To determine *most probable number* (MPN) of coliforms of the given sample.
11. Field visit of water treatment plant.

**07B61CE101 DESIGN OF STEEL STRUCTURES**

Structural steel and their properties, rolled steel sections
Permissible stresses, working stresses, factor of safety, design loads
Simple connections: Riveted, bolted and welded
Design of tension members
Design of axially loaded compression members and built-up columns
Design of beams, plate girders.
Estimation of Wind & Earthquake forces for towers

**07B61CE103 FOUNDATION ENGINEERING**

Foundation requirement, types and selection, methods of determining bearing capacity of shallow foundations
Settlement considerations; allowable, total and differential settlements, estimation of settlement of structures

Eccentrically loaded footings
Raft foundation; types, design principle of rigid raft foundation
Pile foundation; types, pile load capacity, static and dynamic formulae, pile load test, pile groups; load capacity and settlement
Well and Cassion foundation: stability analysis and bearing capacity
Sheet Pile Walls & Bulk Heads: types and analysis
Strutted Excavations and Bracing
Ground Improvement Techniques: compaction, stabilization and soil reinforcement
Site Investigation and Soil Exploration
Machine Foundation: types of machine foundations design criteria and design of block foundation.

**07B61CE104 TRANSPORTATION ENGINEERING**

RAILWAYS:
History of railways in India, alignment and project reports, permanent way and track materials, geometric design, railway points and crossings and junction, track laying, track drainage, station yards, maintenance of track.
AIR PORTS:

Development of air transport in India ,airport planning, air port design standards, terminal lay out & classification, Design of air port pavements, drainage, marking &lighting, heliports, air traffic control, air cargo, accidents in the air, maintenance of air ports .

DOCKS, HARBOURS &INLAND WATER WAYS:

Historical development in India , tides, winds & waves, docks, harbours, break waters, jetties, landing stages & wharves, dry docks, transit sheds, cargo handling, , inland water transport. Maintenance.

MINOR MODES OF TRANSPORTATION:

Pipelines, elevators, belt conveyors, aerial rope ways, & under sea transportation.

**08B61CE105 SEWAGE TREATMENT AND DISPOSAL**

Collection of sewage: Importance of sanitation, Systems of sewerage – separate, combined and partially separate. Quantity of sanitary sewage and variations. Shapes of sewer – circular and egg shaped. Design of sewers, self-cleansing velocity and slopes, Construction and testing of sewer lines. Sewer materials. joints and appurtenances.

Sewage Characterization: Quality parameters- BOD, COD, Solids, D.O., Oil & Grease. Indian Standards for disposal of effluents into inland surface sources and on land.

Sewage Treatment: Objectives, sequence and efficiencies of conventional treatment units. Preliminary treatment, screening and grit removal units. Theory and design aspects of primary treatment, secondary treatment- activated sludge process & its modifications, Tricking filter, sludge digestion and drying beds.
Stabilization pond, aerated lagoon, UASB process , septic tank and Imhoff tank. .

Disposal of Sewage: Disposal of sewage by dilution – self-purification of streams. Sewage disposal by irrigation (sewage treatment).

**08B61CE106 ADVANCED STRUCTURAL ANALYSIS**

*Virtual Work Principles Based on Virtual Displacements*

Virtual Work, The Principle of Virtual Displacements, Virtual Displacements of a Particle and External Virtual Work, Virtual Displacements of a Deformable Body and Internal Virtual Work

*Matrix Methods of Analysis for Discrete Structures*

Flexibility and Stiffness matrices and their generation, Concept of stiffness method, types of skeletal structures, degree of freedom, Stiffness matrix for: Truss elements, Beams in 1-D, 2-D and 3-D,

Formation of the Global Analysis Equations, The General Assembly Procedure, Applying Boundary conditions and Calculating Support Reactions

Analysis of simple plane trusses and plane frames with stiffness matrix method

*Programming of Direct Stiffness Analysis of simple 2D framed Structures*

*Introduction to Finite Element Method*

Finite Element Approach to Structural Analysis, Basic steps of finite element method for structural analysis, types of elements, shape functions.

**08B61CE705 ENVIRONMENTAL ENGINEERING LAB-II**
**List of experiments:**

1. To determine the optimum *coagulant dose* quantity for given sample of raw water.
2. To determine chlorine demand and residual chlorine.
3. To find the quantity of *dissolved oxygen* and *biochemical oxygen demand* (BOD) present in the given water sample/sewage sample.
4. To find out *chemical oxygen demand* (COD) of the given wastewater sample.
5. To determine *most probable number* (MPN) of coliforms of the given sample.
6. To determine the *suspended particulate matter* (SPM) *and respirable particulate matter* (RPM) in ambient air.
7. To determine the $SO_2$ concentration of the atmosphere.
8. To determine the $NO_2$ concentration in ambient air.

**07B61CE703 FOUNDATION ENGINEERING LAB**
**List of Experiments**

1. Consolidation test
2. Triaxial compression test (Undrained condition)
3. Direct shear box test
4. Vane shear test
5. Unconfined compression test
6. Swelling pressure test
7. CBR test (Unsoaked)
8. CBR test (Soaked))
9. SPT test (Demonstration)

**07B61CE704 CIVIL ENGINEERING SOFTWARE LAB**

1. AutoCAD: Plan, Elevation, Foundation, Column.

2. Spreadsheets: Problem based on civil related topics like structures, fluid mechanics.

3. STAADPro: Introduction, Modeling and Analysis of structures.

4. Ansys: Introduction, Analysis of 2-D structures, Plane frames.

5. MatLAB: Programming of Analysis of building.

6. Primvera: Introduction

**07B71CE403 ENVIRONMENTAL MANAGEMENT & IMPACT ASSESSMENT**

Environmental management **:**
Environment; Definition and elements - Interaction between abiotic and biotic elements Human interference with the environment -Resource exploitation and use of technology Impact of man, technology on environment - Exploitation and destruction Environmental degradation - current environmental concerns.
Concept of environmental management - Conservation, preservation and sustainable development
Environmental impact assessment**:**
Introduction to environmental impact assessment - Frame work of Environmental Assessment, prediction and assessment of impact on the air, water, biological & socioeconomic environment – methodologies of EIA, Future Environmental impact assessment - Some specific studies on environmental impact assessment of certain projects: Hydropower project, highway project, cement manufacturing.
Environmental audit**:**
Introduction - Types of Audits - Features of Effective auditing - programme Planning - Definition - Organisation of Auditing Programme - pre visit data collection Audit Protocol - Onsite Audit - Data Sampling - Inspections - Evaluation and presentation Audit Report.
Various environmental management systems.

**07B71CE404 ENERGY RESOURCES & CONSERVATION**

Conventional energy source: Hydropower: Fossils fuels and thermal powers, nuclear powers.
Non-Conventional energy source: solar energy, Solar Insulation, types of solar collector, solar cell, energy from wind, theory of wind power, wind system design
Energy from biomass: Design of biogas Plant.
Ocean energy, geothermal energy, Economic potential and cost

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Energy conservation-principles, technologies, waste heat utilization, heat regenerators, energy storage, devices, instruction and control.

**07B71CE411 HYDROPOWER ENGINEERING**

Hydraulic Turbines: Classification ,Working principles and Design of Pelton wheel, Francis and Kaplan Turbine, Velocity Triangles , head and efficiency , Draft tube , Theory and types, Similarity laws ,specific speed, Operating characteristics . Turbines, Selection of Turbines, Model Studies.

Pumps

Classification, Centrifugal pump Components and working, Velocity triangles priming, Head Losses and Efficiencies, Minimum starting speed, performance curves, specific speed, Cavitation, selection of pumps.

Positive Displacement Pump

Reciprocating pump, types, Components and working , slip , Indicator diagram, Air vessel.

Miscellaneous Pumps (Operating Principles Only)

Multistage pumps, submersible pumps, Jet pumps, Airlift pumps, Gear Oil pump, Hydraulic ram.

Principles of hydropower development: Types+,, layouts and Component works. Surge tanks, Types and choice. Flow duration curves and dependable flow. Storage and pondage. Pumped storage plants. Special features of mini, micro, hydel plants

**07B71CE412 DAMS AND RESERVOIR DESIGN**

Planning of project, Purpose of development, Project study, Ecological and environmental considerations, Flood studies, Economic considerations.

Selection of type of dam, Classification of types, Physical factor governing selection of type, legal, economic, aesthetic considerations.

Foundation and construction materials :

Investigation, Source of information, Surface exploration, sampling, Field and laboratory tests

Earthfill dam:

Origin , Selection of type, Design principles, Foundation design, Embankments, Embankment details

Rockfill dam :

Origin and usage, Definition and types , Foundation design, Embankment design, Membrane design

Concrete gravity dam:

Introduction, Origin and development, Forces acting on dam, Requirements for stability, Dams on pervious foundations

**07B71CE422 UNDERGROUND TECHNOLOGY**

Introduction to various underground structures
Underground construction methodology & equipments
Excavations, soil support methods, diaphragm walls
Management of groundwater, dewatering methods
Coffer dams, Caisson & wells
Methods of Basement construction
Grouting
In–situ Densification: Preloading, Compaction Grouting, Dynamic Compaction, Blast densification, Vibro–Compaction and Vibro–Replacement, Compaction piles, Reinforcement of embankments and foundations
Tunnels: Introduction, Tunnel stabilization and lining, Cut and Cover Tunnels, Bored Tunnels, Immersed Tube Tunnels, Water Conveyance Tunnels, Micro-tunnels
Underground Conduits: Ditch Conduits, Positive Projecting Conduits, Negative Projecting Conduits, Imperfect Ditch Conduits, Tunneled Conduits

**07B71CE423 ADVANCED CONCRETE TECHNOLOGY**

Plain Concrete, Reinforced concrete, Pre-stressed Concrete, Cellular Concrete,. Light weight concrete, Smart Concrete, Fibre Reinforced Concrete, Ferrocement, Polymer Concrete Composites, Special concretes, Self-Compacting Concrete, Admixtures, Fly Ash Concrete, High Performance Concrete, Admixtures, Properties of hardened concrete. Standards, Specifications and Codes of Practice, Quality control, Repairing concrete, special processes and technology for particular types of structure, Ready-mixed concrete, Assessment of concrete construction.

**07B81CE401 ADVANCED RCC DESIGN**

Design of Bunker & Silo,
Design of Retaining walls
Design of water tank, culverts,
Design of Flat Slabs, Building Frames,
Design of Chimneys.

**07B81CE404 ADVANCED HYDROPOWER ENGINEERING**

Planning of hydropower development, site investigations, Hydrological investigations, assessment of Hydropower potential, water availability, installed capacity determination.
Design of civil works: Diversion structures, water conductor systems, desilting tanks, cross drainage structures, forebay, Surge tanks and hydraulic transients, Penstocks and pressure shafts, Intakes, penstock, powerhouse, and tailrace.

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Operation of power plants for peaking and base load, Characteristics of power market, Integration of various types of plants, Augmentation of power plants, Pump storage plants
Reservoir operation for hydropower generation in multipurpose projects.
Basin scale hydropower generation in a multipurpose project, Basin scale hydropower development.

**07B81CE411 FINITE ELEMENT METHODS AND ITS APPLICATIONS TO CIVIL ENGINEERING**

Introduction
Matrix-Displacement Formulation
Element Shapes, Nodes, Nodal Unknowns and Co-ordinate Systems
Shape Functions
Strain-Displacement Matrix
Assembly Stiffness Equation – Direct Approach, Galerkin's Method, Virtual Work Method, Variational Method
Applications of FEM in Civil Engineering
1-D Static Problems: Rod, String, Beam, Shaft
One-dimensional Formulations; Boundary Conditions; Solution Algorithms; Descretization; Stress Deformation Analysis
2-D Static Problems: Plane Stress, Plane Strain, Axisymmetric Problems, Stability of Columns and Thin Plates
Two-dimensional Formulations; Boundary Conditions; Solution Algorithms; Descretization; Stress Deformation Analysis
Introduction to Commercial Packages and Recent Developments

**07B81CE415 HIGHWAY CONSTRUCTION, MAINTENANCE AND MANAGEMENT**

Highway construction:
Introduction, history of road construction, equipments for the road construction, stages of construction, limitations in pavement construction due to weather.
Earthwork:
Clearing and grubbing, excavation, embankment construction, replacement of soils, soil stabilization.
Bituminous pavement construction:
Sub grade, granular sub base, sub base course, binder course, wearing coat, interlayer coats.
Cement concrete pavement:
Sub grade, base and sub base courses, concrete surfacing, joints for cement concrete pavement,

Highway maintenance:
General, distress in pavements (Cracking, patching, rutting, pot holes, stripping and swelling), evaluation of pavement, structural evaluation, pavement maintenance.
Introduction to transport economics.
Recycling of pavements:
Introduction, selection of road for recycling, methods and equipments for recycling.
Hill Roads: Alignment, geometrics, design and construction for hill roads, drainage design, maintenance problems in hill roads.

**07B81CE421 EARTHQUAKE ENGINEERING**

Nature of Earthquakes: Plate Tectonics Theory, Faults and fault movements, Magnitude of earthquakes, Intensity scaling of earthquakes: subjective intensity and instrumental intensity, Characteristics of earthquake ground motions
Response of Simple Structures to Earthquake Ground Motions: Seismic response of linear elastic single degree of freedom (SDOF) systems, Seismic response of inelastic SDOF systems
Response spectra
Response of Multi Degree of Freedom Systems (MDOF) to Earthquake Ground Motions: Free vibration analysis, Equivalent Lateral Load Procedure, Mode Superposition Procedure
Seismic Design Principles: Earthquake design philosophy, Design spectrum, Earthquake resistance of building systems, Response modification factors
Seismic Code Procedures: Classification of building systems, Selection of analysis procedure, Capacity design principles for reinforced concrete buildings, Case study: analysis and design of a multistory R/C frame

**07B51CE422 PRESTRESSED CONCRETE STRUCTURES**

Introduction to basic concept of prestressing, System of prestressing , Loss of prestress, Analysis for flexure, Design for flexure shear and torsion, Deflection and cracking consideration, Precast elements: poles, railway sleepers, beams, slab, wall panel and columns, use of relevant codes of practice.

# Outline Syllabi for Computer Science and Engineering

### 07B11CI101 INTRODUCTION TO COMPUTER AND PROGRAMMING

Computer applications. Basic computer architecture. Programming language hierarchy. Program translation and execution. Algorithms, Pseudo codes and flowcharts. Program design and Basic software development life cycle. Program as State machine. Basic testing and debugging. Number system. Character & Instruction representation. Data types. User interaction. Structured programming. Selection. Control flow. Looping control structure. Arrays and strings. Pointers. Functions. Structures. Unions. Enumerations. Preprocessor. Iteration. Recursion. Dynamic memory allocation. Linked-lists. File I/O. Simple graphics and multimedia operations. C Libraries. User defined header files. HTML.

### 07B21CI102 DATA STRUCTURES

Data centric approach to software development. Problem analysis and Data design. Time and space complexity. Searching. Sorting. Algorithm visualization. Data types and representation. Abstract Data Types. Tagged, Array based, Linked, Indexed, and Simulated pointer based storage. Lists. Electronic text. Hypertext. Orthogonal Lists. Sparse matrices. List of list. Doubly linked lists. Stack. Recursion removal. Queue. Dequeue. Buffer. Discrete event simulation. Tree. Binary Tree. K-ary Tree. Binary Search Tree. Tree traversal. Graphs and graph traversal. Simple graphics and multimedia data structures. Kd Tree. Quad Tree. Octree.

### 07B31CI103 OBJECT ORIENTED PROGRAMMING

Interactive Software. O-O paradigm. Objects, Classes, Methods, Constructors and Destructors. Complex classes. Object-oriented Analysis-Class Diagram & Object Diagram. File Handling. Friend Functions and Static member functions. Inheritance. Multiple Inheritance. Polymorphism and Virtual Functions. RTTI and Casting types in C++. Function and Operator overloading in C++. Namespace and Templates in C++.

STL and Container classes. AWT, Swing and Applet. Java Graphics. Concept of Packages and Class path. Interfaces in JAVA. Exception Handling in C++ and JAVA. Basic Object-Oriented testing.

**07B31CI104 DATABASE SYSTEMS**

Database driven Interactive software. Database models. Relational algebra. Relational calculus. SQL. PL/SQL. ER & EER Modeling. Data constraints. Data dependencies. Normalization. Transactions. Concurrency. Recovery. Query processing. Client server architecture. Introduction to web enabled and multimedia databases. Introduction to database driven mobile services.

**07B41CI105 MICROPROCESSOR AND CONTROLLERS**

Interactive systems. Evolution of microprocessors. Intel 8086 family Processors and 8051 controller - Architecture, Functions, Programming. Addressing modes. Hardware specification. Memory interface. Interrupts. I/O interfacing. Direct memory access and DMA controlled I/O. Serial data communications. Introduction to Embedded systems. System design notations. System testing. Introduction to processors for Mobile devices.

**07B42CI101 COMPUTER ORGANISATION**

Introduction to structured computer organization. Review of digital components. Register transfer and micro-operations. Instruction codes, computer instructions, timing & control, instruction cycle, Classification of instruction set. Instruction format. Addressing modes. Assembly language programming. Micro-programmed control. Program control, CISC and RISC. Computer Arithmetic. I/O organization and Memory organization. Introduction to mobile processor. Pipelining and Multiprocessors. Performance Analysis.

**07B41CI106 FUNDAMENTALS OF ALGORITHMS**

Review of Set theory, Induction, Series evaluation and Data Structure. Asymptotic analysis. Growth of functions. Recurrences. Divide and conquer algorithms. Dynamic programming. Greedy algorithm. Backtracking. Decision tree. Game tree. Index trees – IBST, TBST. Balanced Tree - AVL, and B Trees. Splay Tree. Heap. Graph algorithms - minimum spanning tree, shortest path, Hamiltonian cycle. String matching. Basic computational geometry. Introduction to kinetic data structures.

**07B51CI107 OPERATING SYSTEMS**

Introduction. Operating system structure - Monolithic systems, Layered systems, Virtual machines. Client-Server model. Process Management - IPC, RPC, Classical IPC problems. Process scheduling. Processor Allocation - Allocation Model, Design issues for processor allocation algorithms. Threads. Deadlock. Security. Memory Management. TSRs. File System management. Input output management. Disk scheduling. Basics of Real Time Operating Systems and Mobile Operating Systems. Case study of UNIX/LINUX.

**07B51CI108 SOFTWARE ENGINEERING**

Interactive Systems. Usability. Software process models. Personal software process, Team software process. Requirement engineering, Software requirement specifications. Formal system development techniques. Analysis and modeling. Software architecture and design. UML. Design patterns. Software estimation - COCOMO model, Putnam model. Software metrics. Coding standard and practices. Software testing. Software maintenance. CASE Tools. Introduction to software engineering for web and mobile applications.

**07B51CI109 THEORY OF COMPUTATION**

Finite Automata. Finite Automata with output. Regular languages. Context free languages. Pumping Lemma for regular language and CFL. Push down Automata-Deterministic, non deterministic Automata. Turing Machines. Universal Turing Machines. Linear bounded automata. Halting Problem. Reducibility. Polynomial Time Algorithms and Non Deterministic Polynomial Time Algorithms. Simulation tools.

**07B52CI102 WEB APPLICATION ENGINEERING**

Web enabled interactive software. Database driven websites. Online Games. Basic Web Architecture. Web Server. Application server. Markup Languages - SGML, HTML, XML and XHTML, DHTML, WML. Cascading Style Sheets. Web Development Life Cycle. Java Script. AJAX. PHP. JDBC. Multi Threading. Graphics in PHP, Java, and XML. XML DTD, Schema Definition Language. XSLT, XQUERY, and XPATH. DOM and SAX parsers.

**07B61CI110 COMPUTER NETWORKS**

Network classification. Computer network examples. Layering concept of network. OSI network model and functions of layers. Physical, Data Link, Network, transport, session, presentation & application layers. Internet Protocols. TCP/IP suite. Local area networks.

Other protocols. Basic performance issues. Network Standards. Introduction to wireless networks.

**07B62CI103 INFORMATION SYSTEMS**

Information System Theory & Modeling. Information system volatility & resources. Domain specific Information systems. Functional Area Applications. Domain Analysis. Human Computer Interface. Decision Theory. Decision Support Systems. Information System effectiveness matrix. Mobile information system. E-Governance. Supply chain management. Enterprise Resource Planning. E-Commerce. CRM. Basic GIS.

**07B62CI104 DATA MINING**

Data Warehouse Software Engineering - Requirement analysis, Dimensional modeling, Design, Project management, Building, and Testing. Query access architectures. Extraction Transformation Loading. OLAP. Data warehouse security. Metadata. Data mining models. Statistical data mining. Classification. Clustering. Association Rules. Hypothesis testing. Text and Web mining

**07B61CI111 COMPILER DESIGN**

Introduction. Lexical Analysis. Syntax Analysis. Top down –Recursive Descent ,LL(1),Operator Precedence Parsers and Bottom-up Parsers-LR ,LALR. Semantic Analysis. Symbol Table Management. Storage Management. Error Handling. Code Optimization. Code Generation. Software tools- LEX, YACC.

**07B61CI112 COMPUTER ORGANISATION AND ARCHITECTURE**

Register level design, Processor level design. System level design, Advanced data representation. Instruction set architecture level. Data-path Design. Hardwired control unit, micro-programmed control unit, pipeline control unit. Structured Memory Design. Bus System. System control. I/O Control. Performance analysis. Processor array. Multi-computer and Multi-processor systems**.**

**07B61CI241 OBJECT ORIENTED SYSTEMS AND PROGRAMMING**

Interactive database driven software. O-O paradigm. Objects, Classes, Methods, Constructors and Destructors. File Handling. Friend Functions and Static members functions. Inheritance. Polymorphism and Virtual Functions. Interfaces in JAVA. Exception Handling in C++ and JAVA. Basic principles of Software engineering. System analysis, design, testing and debugging. Database Environment. Relational Model. SQL.

PL/SQL. ER & EER Modeling. Normalization. Database Connectivity. Transaction Processing

**07B81CI416: NETWORK MANAGEMENT**

Data Communications and Network Management Overview, Review of Computer Network Technology, Basic Foundations of Network management, standards, models and languages, SNMP v1 Organisation, Information, Communication and functional Models models, SNMP v2, SNMP v3, SNMP management RMON, Broadband Network Management: ATM Networks, Broadband Network Management:Access Networks, TMN, Network Management Tools, systems and applications, Web Based Management.

**07B82CI405: CRYPTOGRAPHY AND NETWORK SECURITY**

Foundation of Security & Cryptography, OSI security architecture, Security Policy, Classical encryption techniques(Substitution Techniques, Transposition Techniques and Staganography), Mathematical Tools for Cryptography: Finite fields, number theory, Design Principle of Block Ciphers:DES, Block Cipher Algorithms: AES, Pseudo Random Numbers & Stream Ciphers: Multiple Encryption, Block Cipher modes of operation, stream ciphers, Confidentiality, Public Key Cryptography: RSA, Key management, Hashes & Message Digest:Authentication functions, Message authentication codes, Hash functions and their security, Digital Signature, Certificates & standards, Authentication:X.509 Authentication service, Electronic Mail Security:S/MIME, IP and Web Security Protocols:IPsec, Secure socket layer and transport layer security, secure e-transaction, System Security : Computer Virus, Firewall & Intrusion Detection , Trusted systems, Security Investigation/Audit.

**08B81CI425: STORAGE NETWORKS**

Data proliferation, Storage infrastructure components, Evolution of storage, Information Lifecycle Management, Basic storage management skills and activities, Intelligent Disk Subsystems Overview, Architecture of Intelligent Disk Subsystem, RAID & Parity algorithms, Hot Sparing & Swapping, Caching: Acceleration of Hard Disk Access, JBOD, DAS, SAN, NAS, evolution, Storage Area Networks (SAN): elements & connectivity, Fibre Channel SAN & Products, IP SAN Technology & Products, IP SAN elements, standards (iSCSI, iFCP, mFCP, FCIP and iSNS), Migration from SCSI and Fiber Channel to IP storage, Network attached Storage: elements & connectivity, Requirements of Management Systems, In-band & Out-band Management, The concept of storage virtualization, Storage virtualization on various levels of the storage network, Symmetric & Asymmetric Storage virtualization, Performance of SAN virtualization, Scaling storage with virtualization.

**07B82CI406: E-COMMERCE**

Electronic Commerce – Technology and Prospects, Internet and Intranet-Based E-Commerce, Network Infrastructure for E-Commerce, Broad-Band Telecommunication, Mobile Commerce/Mobile Computing, Wireless Application Protocol, E-Commerce and Web Security, Network Security, Transaction Security, Virtual Private Network, Design your Site, Server Hardware, Connectivity, E-Commerce Software, Quality Assurance, Web Site Maintenance and Management, Cost Factor, Web Hosting Service, Marketing Web Site, Electronics Payment Systems, Online Banking, EDI and its Application, E-Commerce law and forms of Agreements, Role of government in E-Commerce, Supply-Chain Management in E-Commerce, Customer Relationship Management, Business to Business Electronic Commerce, Business to Consumer Electronic Commerce, Business Strategy, Internet Commerce Architecture, Problems and Prospects of E-Commerce, E-Commerce Standards, The Future.

**08B81CI427 ALGORITHM DESIGN PRINCIPLES**

Review of basic and advanced data structures , Sorting algorithms : Merge and Quick Algorithms with Numbers: Modular Arithmetic, Euclid's Algorithm & its Extension, Randomized Primality Testing, More about Randomized Primality Testing & Cryptosystems, RSA Cryptosystem Divide and Conquer Algorithms, Graph Representations: Depth First Search; Strongly Connected Components: Breadth First Search ,Greedy algorithms, Dijkstra's Algorithm, Minimum Spanning Trees, Huffman Encoding , Dynamic Programming: Knapsack, Combinatorial optimization, approximation algorithms, Chain Matrix Multiplication, Shortest Paths Revisited, NP-Completeness Introduction , NP-Complete Problems, Reductions and Examples, Coping with NP-completeness, Evolutionary computing algorithms.

**08B81CI428: ADVANCED OPERATING SYSTEM INTERNALS**

OS Overview, Programming in C & UNIX , UNIX I/O system calls, Computer system Overview & OS overview, Processes: Process description & Control, Threads, SMP & Microkernels, Concurrency: Mutual Exclusion & syncronization, Deadlock & starvation, Memory: Memory Management, Virtual Memory, Scheduling: revision of uniprocessor scheduling, Multiprocessor & Real-Time Scheduling, I/O & files: I/O management & Disk scheduling, File Management, Distributed Systems: Distributed Processing, Client/Server, & Clusters, Distributed Process Management, Security: Computer Security.

**07B71CI409: SOFTWARE ENGINEERING MANAGEMENT**

Software Re-engineering, Overview of Forward Engineering, Reverse Engineering, Re-engineering., Program Comprehension, Model-Ruven Brook's Model, Solomay Model, Foundation of Automated Program Comprehension, Program Comprehension Tools, Research Tools, Software Metrics, Process Metrics: Size, cost, effort Estimation, COCOMO Model.Project Metrics: Metric for Quality, Product Metrics:_Metrics for Analysis, Metrics for design, Metrics for code, Metrics for Testing Process Metrics: Size, cost, effort Estimation, COCOMO Model. Metric for Quality, Agile Methods, Agile development, SCRUM, extreme Programming., Advance software Testing, Object Oriented Testing , GUI Testing , Real Time system Testing, Automated Testing, cyclomaric complexity, black box testing, data flow testing, graph based testing, Design Pattern, Grasp Pattern:-Creator, Information Expert, Low Coupling, Controller, High Cohesion GOF Pattern:- Adapter , Factory, Singleton, Strategy, Composite, Façade, Observer/Publish-Subscribe/Delegation Event Model, Software Security, Software Threats, Software Piracy and authentication, architecture and design of secure software, process of building secure software, Software configuration Management, Change management.

**07B71CI414 PARALLEL PROCESSING**

Parallel Computer Models,The state of computing, Multiprocesso rs and multicomputer, Multi vector and SIMD computers, PRAM and VLSI Models, Architectural Development tracks, Program and Network Properties, Conditions of parallelism, program partition and scheduling, Program Flow Mechanisms, System Interconnect Architecture, Principles of scalable Performance, performance Metrics and Measures, Parallel processing Applications, Speedup Performances Laws, Scalability and approaches, Processors and Memory Hierarchy, Advanced processor Technology, Superscalar and vector P rocessors, Memory Hierarchy Technology, Virtual Memory Technology, Bus, Cache and Shared Memory, Backplane Bus system, Cache Memory Organizations, Shared Memory Organizations, sequential and Weak Consistency Models, Pipeline and Superscalar Techniques, Lin ear Pipeline processors, Nonlinear pipeline processors,Instruction pipeline Design, Arithmetic pipeline Design, Superscalar and super pipeline design, Multiprocessors and Multicomputer,Multiprocessor system interconnects, cache coherence and synchronizatio n Mechanism, Three generations of Multicomputer

**08B81CI426 PARALLEL COMPUTING ARCHITECTURE**

Introduction to Parallel Processing Approach, Difference between Parallel Processing and Serial Processing, Flynn's Taxonomy for serial and parallel computer architecture, Parallel Algorithms, Performance of Parallel Algorithm. Criteria to evaluate processor organization, Mesh Networks, Binary Tree Networks, Hypertree Networks, Pyramid Networks, Butterfly Networks, Hypercube (Cube-Connected) Networks, Cube-Connected Cycle Networks, Shuffle-Exchange Networks, Case Studies Based on the Parallel Network Architecture. Multiprocessors, Uniform Memory Access (UMA) Multiprocessors and Non-Uniform Memory Access, Mesh of Trees Architecture, Applications based on MoT, Multi-Mesh Architecture, Multi-Mesh of Trees Architecture, One to One Communication Algorithm on Multi-Mesh Architecture and Multi-Mesh of Trees Architecture, All-to-All Algorithm Communication Algorithm on Multi-Mesh Architecture and Multi-Mesh of Trees Architecture, Sorting Algorithms on MMT.

# Outline Syllabi for Electronics & Communication Engineering

**07B11EC101 ELECTRICAL CIRCUIT ANALYSIS**

Electrical sources – DC, AC, Voltage, current and power sources, electrical components - passive and active. Basic circuit laws, AC waveforms-frequency, phase, amplitude, peak, rms, calculation of power, response of passive components on AC waveforms-impedance, RLC circuit, steady state analysis of circuits, network theorems, two port networks, resonance, electrical filters, transmission line parameter, transient analysis of electric circuits, concept of poly-phase systems.

**07B21EC102 BASIC ELECTRONICS DEVICES AND CIRCUITS**

Semiconductor basic theory, PN junctions, transistor theory, PN junction diodes, BJTs, FETs:- characteristics, biasing, different configuration. Review of two port network theory – h and other parameters, equivalent circuits, BJT, FET amplifiers-frequency response, negative and positive feedback, operational amplifiers and their applications. Oscillators. Boolean algebra, logic circuits and gates, FLIP FLOPS, shift registers, counters, timers.

**07B31EC103 ELECTRICAL MACHINE AND INSTRUMENTS**

Basic requirements of electrical machines, single phase and three phase circuits and analysis, transformers, small power ac machines, small power dc machines, introduction to robotics, electric meters- galvanometer, ammeter, voltmeter, wattmeter, multimeter , Measurement of R,L and C, bridges.
Electronic Instruments- CRO, digital meters, function generators, power supplies.

**07B31EC104 SIGNALS AND SYSTEMS**

Signal types and their representation- Time Domain, Frequency Domain. Discrete and Continuous Transforms- Laplace, Fourier and Z- Transforms. Introduction to Random Signals. Systems- Linear and Non-Linear, Continuous and Discrete Systems. System Characterization-Time Domain and Frequency Domain. System Analysis. Systems Stability Criterion. Introduction to DSP.

**07B31EC105 ANALOGUE ELECTRONICS**

Detailed analysis of BJT and FET biasing circuits, stability considerations. Analysis of single and multistage amplifiers. Amplifier with different types of feedbacks. Power amplifiers, tuned amplifiers and oscillators, linear integrated circuits- process technology, differential amplifiers and current mirrors. Op-amp details. Op-amp circuits and applications- active filters, functional amplifiers.

**07B41EC106 SEMICONDUCTOR DEVICES**

Semiconductors- valence and conduction bands, Fermi level, potential barrier, doping, carrier transport phenomenon- drift and diffusion phenomena, PN junctions diode fabrication and theory, BJT and FET theory and application, switching and power consideration in semiconductor devices. Low power devices, working and fabrication of different types of diodes.

**07B41EC107 DIGITAL ELECTRONICS**

Review of logic gates and boolean algebra. Logic families. Minimization techniques for Boolean expression-K-map reduction. Combinational circuit. Sequential circuit. Timing diagram. State diagram. FSM. Basic ALU. Basic of digital memory. Introduction to digital design using VHDL. Waveform and Waveshaping circuits.

**07B41EC108 ANALOG COMMUNICATIONS**

Review of time and frequency domain description of signals, band width concept. Elements of communication system – point to point and broadcast. Propagation of signals through wired and wireless media. Concept and theory of amplitude and angle modulation– generation, detection, spectra, BW and power analysis. PLL theory and application. Sampling theorem – Pulse modulation systems. Time and frequency division multiplexing techniques. Radio transmitters and receivers. Introduction to noise and effect on communication systems.

**07B51EC109 DIGITAL COMMUNICATIONS**

Digital signals – merits and demerits. Baseband transmission of digital signals. Voice and video digitization techniques – coding, decoding, BW and performance. Digital modulation techniques – Binary and M-ary. Line coding techniques. Digital Radio. Channel noise performance. Plesiochronous and Digital Synchronous Hierarchy standards, Introduction to error control.

**07B51EC110 DIGITAL SIGNAL PROCESSING**

Discrete Signals- Z Transform, DFT and FFT. Digital Filters- FIR, IIR and Filter transformation and implementation. Introduction to Digital Signal Processor. Some DSP Application. Adaptive and Multirate Systems.

**07B51EC111 ELECTROMAGNETIC ENGINEERING**

EM Spectrum, Concept of waves – EM waves. Propagation. Application of Cartesian, Cylindrical & Spherical Coordinate Systems. Electrostatic and Magnetostatic Fields. Ampere, Poisson, Gauss, Laplace and Lorentz equations, Maxwell's equations. Transmission Lines. Plane waves, Waveguides. Radiation. Propagation through free space. Microwave sources.

**07B61EC112 TELECOMMUNICATIONS NETWORKS**

Telecommunication network model. Switching technologies: circuit-switching and packet-switching. Different networks types. Computer Networks: Seven layered OSI model. Functions of different layers. Detailed working of data link, network, transport and physical layers with standards. IP and TCP description. Local area networks: Protocols, physical layer specifications. ISDN, B-ISDN, ATM. Network performance.

**07B61EC113 VLSI TECHNOLOGY AND APPLICATIONS**

VLSI Design flow, VLSI circuits and system representation, CMOS processing technology, MOS Transistor Theory, Short channel effects, Elements of Physical Design, Logic Design with MOSFETs, CMOS inverter, Transmission gate, Analysis of CMOS Logic Gates, VLSI Logic circuits, System design using HDL, Memories and Programmable Logic, CPLDs, FPGAs. Reliability and testing of VLSI circuits.

**07B51EC241 COMMUNICATION SYSTEMS**

Concept of spectra and BW, Communication system applications and model. Analogue modulation techniques – amplitude, angle modulation and variations. Sampling and Pulse modulation. Speech coding – PCM, PCM hierarchy. Digital modulation techniques – binary and quaternary. Base band digital transmission – bit rate and bandwidth of digital signals. Line codes. Effect of noise. Bit error rate, example of a digital radio system – mobile communication.

**07M11EC101 ADVANCED COMMUNICATION SYSTEMS**

Review of analogue and digital communication techniques, review of random signals, correlation techniques, linear predictive coding, transform coding, M-ary modulation techniques – MSK, orthogonal coding. Multicarrier modulation techniques – OFDM. Optimum and matched filtering. Multi-user detection theory, spread spectrum techniques.

**07M11EC102 ADVANCED SATELLITE & FIBER COMMUNICATION**

Communications satellites - architecture, orbits**,** frequency bands. Satellite power and bandwidth link budget for different orbits. Satellite multiple access techniques.

Optical fibers - material, drawing, loss spectra, dispersion mechanism. Optical sources. Optical detectors. Couplers and Connecters. Fiber optic power and data rate link budgets. Introduction to optical amplifiers and DWDM.

**07M11EC103 ADVANCED TELECOMMUNICATION NETWORKS**

Review of telecommunications Networks. Digital telephone networks - space, time and hybrid switching techniques. Signaling system#7. Packet switched computer networks - IPv6. VoIP. Real time protocols. Cell switching - ATM, congestion control. BISDN. Routing protocols. QOS. Network Security. High speed network performance anlysis. SNMP

**07M11EC104 VLSI CIRCUIT AND SYSTEM DESIGN**

Building blocks of VLSI, VLSI simulation tools, Review of MOS Transistor theory and CMOS Process Flow, Second order effects in Scaled MOSFET, large and small signal model for MOSFET, MOSFET model for circuit simulation, Parameter Extractions. CMOS Circuit characterization and performance estimation,. CMOS circuit and Logic design,. CMOS Logic Structures, Timing issues in digital circuits, Implementation strategies for VLSI Digital ICs. Semiconductor memories, SRAM and DRAM analysis and design, sense amplifiers.

**07M21EC105 ADVANCED DIGITAL SIGNAL PROCESSING**

Review of DSP Techniques. Digital Signal Processors- Different Architecture. Wavelet. Stochastic DSP- Optimal, adaptive and Multidimensional Filtering Application

**07M21EC106 ADVANCED WIRELESS & MOBILE COMMUNICATION**

Review of mobile communications: GSM and CDMA. Cellular concept and engineering. Propagation model and fading. GPRS and EDGE. 3G mobile communication evolution.
Wireless data networks: IEEE 802.11, 15, 16, 20.
Personal area networks: Bluetooth.

**07M21EC107 INFORMATION AND CODING THEORY**

Review of probability theory. Definition and interpretation of information, entropy, mutual information, Shannon's theory – source coding, channel coding, discrete and

continuous channels, channel capacity, source coding algorithms, ideal communication systems, power –BW trade-off. Review of linear algebra, need for error control, block codes – Hamming, cyclic, BCH, Reed- solemn, convolution codes – viterbi decoding. Turbo codes, space time codes.

**07B81EC417 LINUX AND ITS APPLICATIONS**

Introduction to Unix and Linux, installing Linux as a dual boot system, using the command prompt, some unix/linux commands, discussion and practical demonstration of Latex, Kile, Lyx, Gnuplot, Xfig, Inkscape, Maxima, WxMaxima and Octave.

**08B71EC410 SPEECH CODING AND PROCESSING**

Speech coding: Uniform, non linear and adaptive quantizers and their optimization. Predictive coding: DPCM, ADPCM, APC and LPC. Sub band coding and transform coding.

Speech processing: Speech synthesis, Speech features: Filter bank, cestrum and predictor coefficients. Feature extraction, Deterministic sequence recognition and statistical sequence recognition.

# Outline Syllabi for Mathematics Subjects

**07B11MA101 MATHEMATICS-I**

Partial differentiation., Taylors series, Maxima and minima, Jacobians, Double integrals, Equations to a line, plane, curve and surfaces, Line and surface integrals, Gradient, divergence and curl. Normal and tangent to a surface, Gauss and Stokes theorems, Differential Equations with constant coefficients, Laplace Transform, Algebra of matrices, Determinants, Gauss elimination method, Rank, Eigenvalues and vectors, Quadratic forms.

**07B21MA102 MATHEMATICS-II**

Second order linear differential equations, Convergence of series, Solution in series, Bessel and Legendre functions, Chebyshev polynomials, Partial differential equations, Equations of vibrating string, One dimensional wave and heat conduction equations, Functions of a complex variable, Analytic functions, Cauchy-Riemann equations, Conformal mapping, Poles and singularities, Complex Integration, Taylor's and Laurent's series, Cauchy residue theorem and applications.

**07B21MA103 DISCRETE MATHEMATICS**

Basics of set theory, Mathematical induction. Relations, Equivalence relation, partial ordered relation, algorithms and functions. Big O notation, Proposition, Basic logical operators, Propositional functions and quantifiers, Graphs and related definitions, Eulerian and Hamiltonian graphs, Trees, Graph colorings. Algebraic expressions and Polish notation, Shortest path.Algebraic Systems. Languages, Finite State Automata and Machines. Grammars, Lattice and Boolean algebra.

**07B31MA104 PROBABILITY AND STATISTICS**

Classification of data, Measures of central tendency and dispersion. Sample space and events, Axioms of probability, Conditional probability, Baye's theorem, Independent events, Random Variable, Discrete and continuous distributions, Mean and variance of a random variable, Binomial, normal and Poisson distributions, Elementary sampling theory, distribution of means, Statistical decision theory, Test of hypothesis and significance, Chi-square test, Curve fitting by the method of least squares, Correlation and regression, Covariance, Time Series Analysis and Moving Averages.

**07B41MA106 PROBABILITY THEORY AND RANDOM PROCESSES**

Probability, Sample space, Baye's Theorem. One dimensional random variable (discrete and continuous), Bivariate random variables, joint, marginal, and conditional distributions, Covariance and correlation. Characteristic functions, probability distributions, Reliability and hazard rate function. Random processes, Stationary processes. Autocorrelation function, Random walk and Weiner process, Ergodic process, Power spectral density function. Gaussian processes, Poisson processes, Markov chain .

**07B31MA106 NUMERICAL METHODS**

Solution of linear systems of equations - Direct and iterative methods, Eigenvalues and Eigenvectors, Jacobi and Householder methods, Interpolation and Approximation, Numerical differentiation, Numerical integration, Gauss quadrature. Solution of a single and a system of non-linear equations, Initial and boundary value problems in ODE, Numerical solutions of partial differential equations by finite difference method, Method of weighted residuals (MWR).

**07B41MA 107 BIOSTATISTICS**

Multiple linear regressions, Prediction and estimation, Non parametric tests for the analysis of non-normal data. Classification and clustering of data from different sources, Stochastic processes and applications of Markov Chains in Bio-informatics, The applications of Markov Chains in modeling the DNA sequence, Simple random walk, Brownian motion.

**07B71MA403 GRAPH THEORY**

Graphs, connected and disconnected graphs. Various types of graphs. Operations on Graphs. Euler graphs, Fleury algorithm, Hamiltonian graphs, traveling salesman problem. Trees; Binary and rooted trees. Spanning trees, finding all spanning trees of a graph, fundamental cutsets, Network flows. Planar graphs, Kuratowaski's graphs, geometrical and combinatorial duals. Vector spaces, Basis vectors of a graph. Incidence matrix, circuit matrix, cutset matrix, path matrix, adjacency matrix. Coloring of graphs, Four color and five color theorems. Directed graphs, Euler digraphs. Enumeration of graphs, Pólya counting theorem. Algorithms and computer programs of graph theory.

**07B71MA404 BIOMATHEMATICS**

Biological Models- Role and Occurrence of Differential Equations, Linear Differential Equations and Their Systems, Methods of Solutions, Concept of Phase Plane, Stability and Limit Cycles, Modeling of Biological Phenomena : Heart Beat, Blood Flow, Nerve Impulse Transmission, Chemical Reactions, Population Models

**07B81MA408 INTEGRAL TRANSFORMS**

Orthogonal Basis Functions, Periodic Functions, Functions of Any Period, Representation of a Function in Terms of Orthogonal Basis Function, Complex and Trigonometric Fourier series, Properties of Fourier SeriesFourier Cosine and Sine Integrals and Transforms, Fourier Transform, Their Properties and Some Applications Methods of Inverse Laplace Transform and Some Applications, Relationship between Laplace and Fourier Transforms. Hankel Transform, Z-Transform and Some Applications.

**07B81MA409 PARTIAL DIFFERENTIAL EQAUTIONS**

Partial differential equations of the First order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than general method. Charpit's general method of solution. Partial differential equations of second and higher orders. Classification of linear partial differential equations of second order. Homogeneous and non-homogeneous equations of with constant coefficients. Partial differential equations reducible to equations with constant coefficients. Monge's method.

**07B81MA410 BIOMATHEMATICS-II**

First Order Equations and Characteristics, Linear Partial Differential of Second Order, Elliptic, Parabolic and Hyperbolic Equations, Evolutionary Equations- Heat Equation and Separation of Variables. Diffusion through Membranes, Nerve Impulse Transmission- Modeling and Global Behavior, Chemical Reactions- Modeling and Global Behavior. Bifurcation and Bifurcation of Limit Cycle, Chaos and Stability
The Kermack-McKendrick model, Vaccination, Incubation Model and Spreading in Space

# Outline Syllabi for Physics Subjects

**07B11PH101 PHYSICS-I**

Interference, Diffraction and Polarization , Special theory of Relativity, Lorentz transformations and Mass-Energy equivalence, Laws of Radiation, Compton scattering, Atomic spectra, Angular momenta, Atoms in magnetic field, Classical and Quantum statistical distributions, Principle and working of different types of Lasers.

**07B21PH102 PHYSICS-II**

Gauss's law and applications, Laplace and Poisson's equations, Maxwell's equations, Electromagnetic waves, Propagation of electromagnetic waves in free space and in dielectric media, Laws of Thermodynamics, Carnot's engine, Entropy and information, Clausius Cleyperon equation, Matter waves, Uncertainty principle, Schrödinger equation, Particle in a box, Tunneling through potential barrier, Harmonic oscillator, Bonding, Crystal structure, Band theory, Metals, Semiconductors and Insulators, Electronic conduction, Hall effect.

**07B21PH103 BIO-PHYSICAL TECHNIQUES**

Introduction to Molecular Spectroscopy, Width and Intensity of spectral lines, Microwave Spectroscopy, Infrared Spectroscopy, Raman Spectroscopy, Electronic Spectroscopy of diatomic and polyatomic molecules and their applications, Spin Resonance Spectroscopy (NMR & ESR) and applications, X-Ray Crystallography, Mass Spectroscopy, Electron Microscopy (TEM & SEM) and applications.

**07B41PH104 BIOMATERIALS SCIENCE**

Classification of materials, Crystal structure, Bonding, Crystal defects and phase changes**,** Mechanical properties of materials, Surface properties of materials**,** Thermal treatment of materials, Surface improvement (anodization), Magnetic materials, Biocompatible magnetic materials, Super conductivity and its applications, Various types of Polymers and applications of biopolymer, Processing and mechanical behavior of polymers and ceramics, Optical fiber and its properties, Display devices, Science of nanomaterial.

**07B61PH105 MATERIALS SCIENCE**

Dielectric materials, Polarization mechanisms, Dielectric Loss, Piezoelectricity and its Applications, Magnetic materials, Properties and applications, Magnetic Storage Devices, Polymers and Ceramics, Processing, Properties and Applications, Superconducting materials, Meissner effect, High temperature Superconductors and their applications, Optical fibers, Types of fibers, Light propagation and losses in a fiber, Display Devices and Fluorescent materials, Science of Nanomaterials.

**07B41PH106 STATISTICAL THERMODYNAMICS**

Laws of Thermodynamics, Carnot cycle, Entropy, Free energy, Maxwell's relations, Statistical Mechanics, Microcanonical, Canonical, Grandcanonical ensembles, Ensemble averages and ergodicity, Molecular thermodynamics, Microstates, Rotational and Vibrational Partition functions, Monte Carlo methods in Statistical thermodynamics.

**07M11PH101 STRUCTURE OF MATERIALS**

Quantum mechanical study of cohesion and bonding in solids, Point group and Space group symmetry in 2D and 3D structures, Stereographic projections, Reciprocal lattice, Structure factor with application in representative crystal structures, Defects and Dislocations, Description of the physical properties of crystals with relationship to Crystallography and symmetry.

**07B81PH608 PHOTONICS AND MICROWAVE DEVICES**

Basic Optoelectronic Devices. Quantum well devices, Solar Cells, Optical receivers, Optical logic devices, Photo transistors Optical amplifiers, couplers, filters and interconnects. Optical switches, Optical interconnect Optical resonators. Charge Coupled Devices. Noise sources and charge transfer efficiency, 1-D and 2-D architectures, Interlacing methods and charge red out. Microwave devices, Diodes, TED's, FET's, Avalanche transit time devices, Monolithic microwave integrated circuits.

**07B81PH606 WIRELESS NETWORKS**

Basics of wireless Systems, Propagation, Fading, Antennas, Modulation. Wireless network methods, their layout in LAN, WAN, Cellular, Sensors. Wireless mechanisms like dual access and multi access mechanism. Measurement techniques in wireless systems. Security and Privacy.

**07B81EC408 POWER ELECTRONICS**

Introduction,Symbolic representation and basic characteristics of semiconductor diode, zener diode, power transistor,MOSFET, IGBT, thyristor, triac, diac, gate, controlled switches and tunnel diode. Steady state and transient characteristics of a thyristor, Diode model and transistor model of a thyristor, Gate characteristics of a thyristor, Methods of Turn-on of a thyristor, UJT construction, characteristics, pulse trigger circuit and synchronization methods, methods of turn off a thyristor. Voltage current and power rating of a thyristor, Thyristor protection circuits, comparison of thyristor and power transistor as power devices, Operation of thyristors in series and parallel, Commutation methods of thyristors (class A,B,C and D)

Single phase controlled and uncontrolled rectifiers, use of free wheeling diodes. Synchronous inversion. Half controlled and fully controlled converters. 3- phase Dual controlled rectifiers converters-circulating and Coden-circulating current type A.C regulators only introduction, Choppers, their principle of operation. Morgan chopper and Jones chopper. Use of transistors in choppers, Principle of inversion, transistorized, choppers. Thyristor based simple series invertors. Parallel inverters Mc muerray Bedford inverters, current source inverters, Voltage and frequency control methods in short. Regenerative Braking. Principle of Cyclo converter operation. 3 Phase to 1-phase and 3 phase to 3 phase cycloconversion. Comparison of an Inverter with a cyclo converter.

# Outline Syllabi for Professional Development Subjects

**07B11PD101 PRESENTATION AND COMMUNICATION SKILLS**

Communication process and barriers. Listening skills. Speaking skills – phonetics, stress, rhythm and intonation, linguistic and para-linguistic skills, content organization and coherence. Reading skills – intensive and extensive reading, SQ3R technique, vocabulary, morphology. Writing skills – clear writing, abridgment, précis writing, letters, circulars, agenda, minutes, report. Presentation skills.

**07B11PD102 ENGLISH (AUDIT COURSE)**

Functional english grammar - tenses, voice, punctuation, concord, direct-indirect speech, common errors in sentences. Vocabulary – commonly confused and misused words, synonyms, antonyms, spelling, homophones, one word substitute. Comprehension. Conversational skills – interactive sessions. Compositions - paragraph writing, story writing, dialogue writing, letter writing, message, notice.

**07B21PD102 GROUP AND CO-OPERATIVE PROCESSES**

Group – behavior, development, structure and processes. Teams – types and contemporary issues. Individual - personality, learning, perception, values, attitudes and job satisfaction. Assertiveness - communication styles, self expression, social boldness. Emotional intelligence. Transactional analysis - ego states, life positions, transactions, stroking. Motivation. Leadership. Conflict and negotiation.

**07B31PD303 MANAGERIAL ECONOMICS**

Introduction to managerial economics. Basics of demand, supply and equilibrium. Demand theory and analysis. Theory of consumer choice. Business and economic forecasting. Production theory and analysis. Cost theory and analysis. Market structures - perfect competition, monopoly, monopolistic competition, oligopoly and barriers to entry.

**07B41PD104 FINANCIAL MANAGEMENT**

Introduction, scope and objectives, basic financial concepts. Time value of money. Capital budgeting - techniques, cash flows. Long term sources of finance. Concept and

measurement of cost of capital. Leverages, EBIT-EPS analysis. Working capital management. Inventory management. Financial statement analysis.

**07B51PD305 SOCIAL AND LEGAL ISSUES**

Introduction to Indian law - company act, consumer laws, laws of patent. Business ethics & values. Corporate governance - the role of top management, legal provisions and SEBI code, corporate governance in India. Intellectual property issues, copyright in cyberspace, liability of service providers. Cyber crimes & the laws - computer crimes, digital forgery, cyber terrorism, wiretapping. IT laws- IT Act 2000, ICE Bill.

**07B61PD106 PROJECT MANAGEMENT**

Concepts, project life cycle, roles and responsibilities of project manager. Project selection - criteria and models. Project planning. Project strategy - risk management, budgeting and cost estimates. Scheduling - network techniques, Gantt charts. Resource allocation. Monitoring and information system. Project control, auditing, completion & development and process improvement.

**07B71PD601 ENTREPRENEURIAL DEVELOPMENT**

Foundations of entrepreneurship. Strategic management and the entrepreneur. Forms of business ownership and franchising. Buying an existing business, sources of funds, building a marketing plan. E-commerce, integrated marketing communications and pricing strategies. Managing cash flows, creating a successful financial plan. Leading the growing company and planning for management succession. Global aspects of entrepreneurship, opportunities for entrepreneurs.

**07B71PD602 MANAGING AND MARKETING OF TECHNOLOGY**

Introduction. Analysis of the macro environment. Corporate and division strategic planning. Product, services and branding strategies. New product development and product life-cycle strategies. Pricing strategies. Marketing channels and supply chain management. Advertising, sales promotion, personal selling and direct marketing. Creating customer value and loyalty, cultivating customer relationship. Buying decision process. Creating competitive advantage. The global marketplace. Social responsibility and marketing ethics. Managing a holistic marketing organization.

**07B81PD109 TOTAL QUALITY MANAGEMENT**

Concepts, dimensions and evolution. Fundamentals of TQM, employees & customers satisfaction and supplier relationship. Quality gurus, awards, standards and certifications.

Cost of quality and tools of TQM. Statistical process control. Variable and attribute control charts. Six sigma, kaizen, poka yoka. TQM implementation and challenges.

**07B81PD108 KNOWLEDGE MANAGEMENT**

Introduction. Types of knowledge, knowledge workers, valuing knowledge. Communities of practice. Content management, creativity and innovation. Knowledge management strategies. Business processes and the process-oriented organisation. Information and communication technologies (ICT). Management of intellectual capital. Different levels of knowledge management**.** Organisational culture, developing human capital. Building and managing the knowledge repository**.**