# Course Structure & Syllabi

## B.Tech.in Computer Science and Engineering (Data Science)
## [ Four Years ]


**Department of Computer Science**
**Kazi Nazrul University**
**Asansol -713340**

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

### Curricular Structure for First Year (First Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Physics | Basic Science Course | BTCCSBSC101 | 5.5 | 3 | 1 | 3 | 30 | 20 | 70 | 30 | 150 |
| 2 | Mathematics - I | Basic Science Course | BTCCSBSC102 | 4 | 3 | 1 | 0 | 30 | | 70 | | 100 |
| 3 | Basic Electrical Engineering | Engineering Science Course | BTCCSESC101 | 5 | 3 | 1 | 2 | 30 | 20 | 70 | 30 | 150 |
| 4 | Engineering Graphics and Design | Engineering Science Course | BTCCSESC102 | 3 | 1 | 0 | 4 | | 50 | | 50 | 100 |
| **TOTAL** | | | | **17.5** | **10** | **3** | **9** | | | | | **500** |

**STUDENT CONTACT HOURS PER WEEK** : 22 hrs ; **DURATION** : 16 WEEKS / SEMESTER

Theory and Practical Period of 60 Minutes each.

L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

## Curricular Structure for First Year (Second Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Communicative English | Humanities and Social Sciences including Management Course | BTCCSHSMC201 | 3 | 2 | 0 | 2 | 30 | 20 | 70 | 30 | 150 |
| 2 | Chemistry | Basic Science Course | BTCCSBSC201 | 5.5 | 3 | 1 | 3 | 30 | 20 | 70 | 30 | 150 |
| 3 | Mathematics - II | Basic Science Course | BTCCSBSC202 | 4 | 3 | 1 | 0 | 30 | | 70 | | 100 |
| 4 | Introduction to C Programming | Engineering Science Course | BTCCSESC201 | 5 | 3 | 0 | 4 | 30 | 20 | 70 | 30 | 150 |
| 5 | Workshop Practices | Engineering Science Course | BTCCSESC202 | 3 | 0 | 1 | 4 | | 50 | | 50 | 100 |
| TOTAL | | | | **20.5** | **11** | **3** | **13** | | | | | **650** |

**STUDENT CONTACT HOURS PER WEEK** : 27 hrs **; DURATION** : 16 WEEKS / SEMESTER

Theory and Practical Period of 60 Minutes each.

L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

## Curricular Structure for Second Year (Third Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Economics for Engineers | Humanities and Social Sciences including Management Course | BTCCSHSMC301 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 2 | Biology | Basic Science Course | BTCCSBSC301 | 3 | 2 | 1 | 0 | 30 | | 70 | | 100 |
| 3 | Mathematics - III | Basic Science Course | BTCCSBSC302 | 4 | 3 | 1 | 0 | 30 | | 70 | | 100 |
| 4 | Principles of Communication Engineering | Engineering Science Course | BTCCSESC301 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 5 | Analog and Digital Electronics | Engineering Science Course | BTCCSESC302 | 4 | 3 | 0 | 2 | 30 | 20 | 70 | 30 | 150 |
| 6 | Data Structures and Algorithms | Professional Core Course | BTCCSPCC301 | 5 | 3 | 0 | 4 | 30 | 20 | 70 | 30 | 150 |
| 7 | Discrete Mathematics | Professional Core Course | BTCCSPCC302 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 8 | Environmental Sciences | Mandatory Course | BTCCSMC301 | 0 | 0 | 0 | 0 | 20 | | 30 | | 50 |
| **TOTAL** | | | | **25** | **20** | **2** | **6** | | | | | **850** |

**STUDENT CONTACT HOURS PER WEEK** : 28hrs **; DURATION** : 16 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

### Curricular Structure for Second Year (Forth Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Universal Human Values II: Understanding Harmony | Humanities and Social Sciences including Management Course | BTCCSHSMC401 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 2 | Computer Organization and Architecture | Professional Core Course | BTCCSPCC401 | 4 | 3 | 0 | 2 | 30 | 20 | 70 | 30 | 150 |
| 3 | Data Base Management System | Professional Core Course | BTCCSPCC402 | 5 | 3 | 0 | 4 | 30 | 20 | 70 | 30 | 150 |
| 4 | Design and Analysis of Algorithm | Professional Core Course | BTCCSPCC403 | 4 | 3 | 0 | 2 | 30 | 20 | 70 | 30 | 150 |
| 5 | Data Analysis and Visualization | Professional Elective Course | BTCCSPEC401 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 6 | Computer Graphics | | BTCCSPEC402 | | | | | | | | | |
| 7 | Microprocessor and Microcontroller | Open Elective Course | BTCCSOEC401 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 8 | Operational Research | | BTCCSOEC402 | | | | | | | | | |
| 9 | Python Lab | Laboratory Course | BTCCSPPC401 | 1 | 0 | 0 | 2 | | 20 | | 30 | 50 |
| **TOTAL** | | | | **23** | **18** | **0** | **10** | | | | | **800** |

**STUDENT CONTACT HOURS PER WEEK** : 28hrs ; **DURATION** : 16 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

## Elective Paper 1:-

BTCCSPEC401:- Data Analysis and Visualization , BTCCSPEC402 :- Computer Graphics

## Open elective 1:-

BTCCSOEC401:- Microprocessor and Microcontroller, BTCCSOEC402:- Operational Research

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

## Curricular Structure for Third Year (Fifth Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Artificial Intelligence | Professional Core Course | BTCCSPCC501 | 4 | 3 | 0 | 2 | 30 | 20 | 70 | 30 | 150 |
| 2 | Object Oriented Programming | Professional Core Course | BTCCSPCC502 | 5 | 3 | 0 | 4 | 30 | 20 | 70 | 30 | 150 |
| 3 | Formal Language and Automata Theory | Professional Core Course | BTCCSPCC503 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 4 | Data Mining | Professional Core Course | BTCCSPCC504 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 5 | Cloud Computing | Professional Elective Course | BTCCSPEC501 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 6 | Information Theory and Coding | | BTCCSPEC502 | | | | | | | | | |
| 7 | Software Engineering | Professional Elective Course | BTCCSPEC503 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 8 | Information Retrieval | | BTCCSPEC504 | | | | | | | | | |
| 9 | Introduction to R Programming | Laboratory Course | BTCCSPPC501 | 1 | 0 | 0 | 2 | | 20 | | 30 | 50 |
| **TOTAL** | | | | **22** | **18** | **0** | **8** | | | | | **750** |

**STUDENT CONTACT HOURS PER WEEK** : 26hrs ; **DURATION** : 16 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

**Elective Paper 2:-**

BTCCSPEC501:- Cloud Computing , BTCCSPEC502 :- Information Theory and Coding

**Elective Paper 3:-**

BTCCSPEC503:- Software Engineering , BTCCSPEC504:- Information Retrieval

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

## Curricular Structure for Third Year (Sixth Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Compiler Design | Professional Core Course | BTCCSPCC601 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 2 | Operating System | Professional Core Course | BTCCSPCC602 | 4 | 3 | 0 | 2 | 30 | 20 | 70 | 30 | 150 |
| 3 | Computer Networks | Professional Core Course | BTCCSPCC603 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 4 | Machine Learning | Professional Core Course | BTCCSPCC604 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 7 | Data Warehousing | Professional Elective Course | BTCCSPEC601 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 8 | Soft Computing | | BTCCSPEC602 | | | | | | | | | |
| 9 | Sensor Networks | | BTCCSPEC603 | | | | | | | | | |
| 10 | Industrial Management and Environmental Control | Open Elective Course | BTCCSOEC601 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 11 | Human Resource Development and Organizational Behavior | | BTCCSOEC602 | | | | | | | | | |
| 12 | Cyber Law and Cyber Security | | BTCCSOEC603 | | | | | | | | | |
| 13 | Internship in Industry/Research Institute/Academic Institute | Project | BTCCSPPC601 | 1 | | | | | 20 | | 30 | 50 |
| 14 | Indian Constitution | Mandatory Course | BTCCSMC601 | 0 | 2 | 0 | 0 | 30 | | 70 | | 100 |
| **TOTAL** | | | | **20** | **20** | **0** | **2** | | | | | **800** |

**STUDENT CONTACT HOURS PER WEEK** : 22 hrs ; **DURATION** : 16 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

## Elective Paper 4:-

BTCCSPEC601:- Data Warehousing, BTCCSPEC602:- Soft Computing, BTCCSPEC603:- Sensor Networks

## Open elective 2:-

BTCCSOEC601:- Industrial Management and Environmental Control, BTCCSOEC602:- Human Resource Development and Organizational Behavior, BTCCSOEC603:- Cyber Law and Cyber Security

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

### Curricular Structure for Fourth Year (Seventh Semester)

| SL. NO | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Big Data Analysis | Professional Core Course | BTCCSPCC701 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 2 | Internet of Things | Professional Core Course | BTCCSPCC702 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 3 | Neural Network and Deep Learning | Professional Elective Course | BTCCSPEC701 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 4 | E-Commerce and ERP | | BTCCSPEC702 | | | | | | | | | |
| 5 | Image Processing | | BTCCSPEC703 | | | | | | | | | |
| 7 | Business Analytics | Open Elective Course | BTCCSOEC701 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 8 | Human Computer Interaction | | BTCCSOEC702 | | | | | | | | | |
| 9 | Cryptography and Network Security | | BTCCSOEC703 | | | | | | | | | |
| 10 | Block Chain Technology | Open Elective Course | BTCCSOEC704 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 11 | Natural Language Processing | | BTCCSOEC705 | | | | | | | | | |
| 12 | Optimization Technique | | BTCCSOEC706 | | | | | | | | | |
| 13 | Web Mining | Open | BTCCSOEC707 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Game Theory | Elective Course | BTCCSOEC708 | | | | | | | | | |
| 15 | Economic Policies in India | | BTCCSOEC709 | | | | | | | | | |
| 16 | Soft Skill Development | Laboratory Course | BTCCSPPC701 | 1 | 0 | 0 | 2 | | 20 | | 30 | 50 |
| 17 | Project Preliminary | Project | BTCCSPROJ701 | 1 | 0 | 0 | 2 | | 150 | | 50 | 200 |
| **TOTAL** | | | | **20** | **18** | **0** | **4** | | | | | **850** |

**STUDENT CONTACT HOURS PER WEEK** : 22 hrs ;**DURATION** : 16 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

## Elective Paper 5:-

BTCCSPEC701:- Neural Network and Deep Learning, BTCCSPEC702 E-Commerce and ERP, BTCCSPEC703:- Image Processing

## Open elective 3:-

BTCCSOEC701:- Business Analytics, BTCCSOEC702:- Human Computer Interaction, BTCCSOEC703:- Cryptography and Network Security

## Open elective 4:-

BTCCSOEC704:- Block Chain Technology, BTCCSOEC705:- Natural Language Processing, BTCCSOEC706:- Optimization Technique

## Open elective 5:-

BTCCSOEC707:- Web Mining, BTCCSOEC708:- Game Theory, BTCCSOEC709:- Economic Policies in India

# DEPARTMENT OF COMPUTER SCIENCE
## Kazi Nazrul University, Asansol
## B.Tech.in Computer Science and Engineering (Data Science)

## Curricular Structure for Fourth Year (Eighth Semester)

| SL. NO. | SUBJECT | CATEGORY | COURSE CODE | CREDITS | PERIODS | | | EVALUATION SCHEME | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | TU | PR | INTERNAL ASSESSMENT (IA) | | END SEMESTER EXAMINATION (ESE) | | |
| | | | | | | | | TH | PR | TH | PR | TOTAL |
| 1 | Web and Internet Technology | Professional Elective Course | BTCCSPCC801 | 3 | 3 | 0 | 0 | 30 | | 70 | | 100 |
| 2 | Project & Thesis | Project | BTCCSPROJ801 | 10 | 0 | 0 | 20 | | 250 | | 50 | 300 |
| 3 | General Viva Voce | Laboratory Course | BTCCSPPC801 | 1 | 0 | 0 | 0 | | | | 50 | 50 |
| **TOTAL** | | | | **14** | **3** | **0** | **20** | | | | | **450** |

**STUDENT CONTACT HOURS PER WEEK** : 23 hrs ; **DURATION** : 16 WEEKS / SEMESTER
Theory and Practical Period of 60 Minutes each.
L- Lecture, TU- Tutorials, PR- Practical, IA- Internal Assessment, ESE- End Semester Exam.

# 1st Semester

| Subject Name: Physics | Subject Code: BTCCSBSC101 | Subject Credit:4 |
|---|---|---|

## Course Objectives:

To introduce the basic physics concepts relevant to concerned branches of Engineering and Technology.

## Course Outcomes:

1. Construction and working details of different instruments arelearnt.
2. Study of magnetic and dielectric materials enhances the utility aspects ofmaterials.

## Detailed contents:

***Module 1: Electrostatics in vacuum***

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace‟s and Poisson‟s equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady‟s cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field.

***Module 2: Electrostatics in a linear dielectric medium***

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.

***Module 3: Magnetostatics***

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes‟ theorem;the equation for the vector potential and its solution for given current densities.

***Module 4: Magnetostatics in a linear magnetic medium***

Magnetization and associated bound currents; auxiliary magnetic field ; Boundary conditions on and . Solving for magnetic field

due to simple magnets like a bar magnet; magnetic susceptibility and feromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.

***Module 5: Faraday's law***

Faraday"s law in terms of EMF produced by changing magnetic flux; equivalence of Faraday"s law and motional EMF; Lenz"s law; Electromagnetic breaking and its applications; Differential form of Faraday"s law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

***Module 6: Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations***

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time dependent electric field; calculating magnetic field due to changing electric fields in quasistatic approximation. Maxwell"sequationinvacuumandnon-conductingmedium;Energyinanelectromagneticfield;FlowofenergyandPoyntingvectorwith examples. Qualitative discussion of momentum in electromagneticfields.

***Module 7: Electromagnetic waves***

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

## Text/ Reference Books:


1. Griffiths, D. J., Introduction to Electrodynamics (3rd Edition), Prentice Hall;1999.
2. Walker, J., Halliday, D. and Resnick, R., Fundamentals of Physics (10th edition), John Wiley & Sons Inc;2013.
3. Gaur R. K. and Gupta, S. L., Engineering Physics, Dhanpat RajPublications,2003.
4. Palanisamy, P. K., Engineering Physics, Scitech Publications (P) Ltd,2006.
5. Arumugam, M., Engineering Physics, Anuradha Publications,2000.

| Subject Name: Mathematics-1 | Subject Code: BTCCSBSC102 | Subject Credit: 4 |
|---|---|---|

## Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

## Course Outcomes:

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

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. The fallouts of Rolle‟s Theorem that is fundamental to application of analysis to Engineering problems.
3. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
4. To deal with functions of several variables that are essential in most branches of engineering.
5. The essential tool of matrices and linear algebra in a comprehensive manner.

## Detailed contents:

***Module 1: Calculus***

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

***Module 2: Calculus:***

Rolle‟sTheorem,Meanvaluetheorems,Taylor‟sandMaclaurintheoremswithremainders;indeterminateformsandL'Hospital'srule;Maxima and minima.

***Module 3: Sequences and series***

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval‟s theorem.

***Module 4: Multivariable Calculus (Differentiation)***

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

***Module 5: Matrices***

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigen values and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

## Text/Reference Books:


1. Thomas G. B. and Finney, R. L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons,2006.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008.
4. Ramana B. V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th eprint,2010.
5. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole,2005.
6. Bali, N. P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint,2008.
7. Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.

| Subject Name: Basic Electrical Engineering | Subject Code: BTCCSESC101 | Subject Credit: 4 |
|---|---|---|

## Course Objectives:

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

## Course Outcomes:

At the end of the course, student will be:

1. Able to analyse the various electrical networks.
2. Able to understand the operation of DC generators, 3-point starter and DC machine testing by Swinburne‟s Test.
3. Able to analyse the performance of single-phase transformer.
4. Able to explain the operation of 3-phase alternator and 3-phase induction motors.
5. Able to analyse the operation of half wave, full wave bridge rectifiers and OP-AMPs.
6. Able to explain the single stage CE amplifier and concept of feedback amplifier.

## Detailed contents:

***Module 1: DC Circuits***

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

***Module 2: AC Circuits***

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

***Module 3: Transformers***

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto- transformer and three-phase transformer connections.

***Module 4: Electrical Machines***

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

***Module 5: Power Converters***

DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

***Module 6: Electrical Installations***

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

## Text / Reference Books:


1. Kothari, D. P. and Nagrath, I. J., Basic Electrical Engineering, Tata McGraw Hill,2010.
2. Kulshreshtha, D. C., Basic Electrical Engineering, McGraw Hill,2009.
3. Bobrow, L. S., Fundamentals of Electrical Engineering, Oxford University Press,2011.
4. Hughes, E., Electrical and Electronics Technology, Pearson,2010.
5. Toro, V. D., Electrical Engineering Fundamentals, Prentice Hall India,1989.

**Subject Name: Engineering Graphics and Design  Subject Code: BTCCSESC102  Subject Credit: 3**

## Course Objectives:

Engineering Graphics and Design being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

## Course Outcomes:

1. Introduction to engineering design and its place insociety
2. Exposure to the visual aspects of engineering design
3. Exposure to engineering graphics standards
4. Exposure to solid modelling
5. Exposure to computer-aided geometric design
6. Exposure to creating working drawings

***Traditional Engineering Graphics***:

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

***Computer Graphics***:

Engineering Graphics Software; Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

***(Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)***

## Detailed contents:

***Module 1: Introduction to Engineering Drawing***

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

***Module 2: Orthographic Projections***

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

***Module 3: Projections of Regular Solids***

Regular Solids those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

***Module 4: Sections and Sectional Views of Right Angular Solids***

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slabonly)

***Module 5: Isometric Projections*** **covering,**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

***Module 6: Overview of Computer Graphics***

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

***Module 7: Customisation & CAD Drawing***

Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

***Module 8: Annotations, layering & other functions***

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views ofdwelling;

***Module 9: Demonstration of a simple team design project***

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

## Text / Reference Books:


1. Bhatt N. D., Panchal V. M. and Ingle P. R., Engineering Drawing, Charotar Publishing House,2014.
2. Shah, M. B. and Rana B. C., Engineering Drawing and Computer Graphics, Pearson Education,2008.
3. Agrawal, B. and Agrawal C. M., Engineering Graphics, TMH Publication,2012,
4. Narayana, K. L. and Kannaiah P., Text book on Engineering Drawing, Scitech Publishers,2008.

| Subject Name: Basic Electrical Engineering Lab | Subject Code: BTCCSESC101 | Subject Credit: 1 |
|---|---|---|

**Laboratory Objectives:**

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriateratings.
3. Understand the usage of common electrical measuring instruments and basic characteristics of transformers and electrical machines.
4. Get an exposure to the working of power electronic converters.

**Laboratory Outcomes:**

This lab curriculum gives fundamental understanding of design of electrical instrument with targeted accuracy for physical measurements.

**Experiments from the following:**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-Circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.

7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super synchronous speed.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

| **Subject Name: Physics Lab** | **Subject Code: BTCCSBSC101** | **Subject Credit: 1.5** |
|---|---|---|

**Laboratory Objectives:**

Training field oriented Engineering graduates to handle instruments and their design methods to improve the accuracy of measurements.

**Laboratory Outcomes:**

Physics lab curriculum gives fundamental understanding of design of an instrument with targeted accuracy for physical measurements.

**Experiments from the following:**

1. Experiments on electromagnetic induction and electromagnetic breaking.
2. Experiments on LC circuit and LCR circuit.
3. Experiments on Resonance phenomena in LCR circuits.
4. Experiments on Magnetic field from Helmholtzcoil.
5. Measurement of Lorentz force in a vacuumtube.

# 2nd Semester

| Subject Name: Communicative English | Subject Code: BTCCSHSMC201 | Subject Credit: 2 |
|---|---|---|

**Course Objectives:**

- To improve the language proficiency of the students in English.
- To enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
- To develop the communication skills of the students in both formal and informal situations.

**Course Outcomes:**

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

***Module 1: Vocabulary Building***

1.1 The concept of Word Formation

1.2 Root words from foreign languages and their use in English

1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.

1.4 Synonyms, antonyms, and standard abbreviations.

***Module 2: Basic Writing Skills***

2.1 Sentence Structures

2.2 Use of phrases and clauses insentences

2.3 Importance of proper punctuation

2.4 Creating coherence

2.5 Organizing principles of paragraphs in documents

2.6 Techniques for writing precisely

***Module 3: Identifying Common Errors in Writing***

3.1 Subject-verbagreement

3.2 Noun-pronounagreement

3.3 Misplaced modifiers

3.4 Articles

3.5 Prepositions

3.6 Redundancies

3.7 Clichés

***Module 4: Nature and Style of sensible Writing***

4.1 Describing

4.2 Defining

4.3 Classifying

4.4 Providing examples orevidence

4.5 Writing introduction andconclusion

***Module 5: Writing Practices***

5.1 Comprehension

5.2 Précis Writing

5.3 Essay Writing

***Module 6: Oral Communication***

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication atWorkplace
- Interviews
- Formal Presentations

**Text/Reference Books:**


1. Michael Swan., Practical English Usage. OUP.1995.
2. Wood. F. T., Remedial English Grammar. Macmillan.2007
3. William, Z., On Writing Well. Harper Resource Book.2001
4. Liz Hamp-Lyons and Ben Heasly, Study Writing.. Cambridge University Press.2006.
5. Sanjay Kumar and Pushp Lata, Communication Skills.. Oxford University Press.2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

| Subject Name: Chemistry | Subject Code: BTCCSBSC201 | Subject Credit: 4 |
|---|---|---|

**Course Objectives:**

To make the students conversant with:

- Treatment of water for domestic and industrial purpose.
- Applications of different kinds of Polymers, Lubricants and adhesives.
- Types and mechanism of corrosion and control measures.
- Application of different types of abrasives and chemical nature of building materials and composites.
- Chemistry of different types of Fuels and Explosives.

**Course Outcomes:**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecularforces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

***Module 1: Atomic and molecular structure (12 lectures)***

Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nano particles. Forms of the hydrogen atom wave functions andtheplotsofthesefunctionstoexploretheirspatialvariations.Molecularorbitalsofdiatomicmoleculesandplotsofthemulticentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on bandstructures.

***Module 2: Spectroscopic techniques and applications (8 lectures)***

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

***Module 3: Intermolecular forces and potential energy surfaces (4 lectures)***

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H3, H2F and HCN and trajectories on thesesurfaces.

***Module 4: Use of free energy in chemical equilibria (6 lectures)***

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellinghamdiagrams.

***Module 5: Periodic properties (4 Lectures)***

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

***Module 6: Stereochemistry (4 lectures)***

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality,

enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds

***Module 7: Organic reactions and synthesis of a drug molecule (4 lectures)***

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

**Text/Reference Books:**


1. Mahan, B. H., UniversityChemistry.
2. Sienko M. J. and Plane R. A., Chemistry: Principles andApplications.
3. Banwell C. N., Fundamentals of MolecularSpectroscopy.
4. Tembe, B. L., Kamaluddin and Krishnan, M. S., Engineering Chemistry (NPTELWeb-book).
5. Atkins, P. W., PhysicalChemistry.
6. Volhardt, K. P. C. and Schore N. E., Organic Chemistry: Structure and Function, 5th Edition
7.


| **Subject Name: Mathematics-II** | **Subject Code: BTCCSBSC202** | **Subject Credit: 4** |
|---|---|---|

**Course Objectives:**

The objective of this course is to familiarize the prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

**Course Outcomes:**

The students will learn:

- The mathematical tools needed in evaluating multiple integrals and theirusage.

- The effective mathematical tools for the solutions of differential equations that model physicalprocesses.
- The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering problems.

***Module 1: Multivariable Calculus (Integration): (10 lectures)***

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

***Module 2: First order ordinary differential equations: (6 lectures)***

Exact,linearandBernoulli"sequations,Euler"sequations,Equationsnotoffirstdegree:equationssolvableforp,equationssolvablefory,equations solvable for x and Clairaut" stype.

***Module 3: Ordinary differential equations of higher orders: (8 lectures)***

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

***Module 4: Complex Variable – Differentiation: (8 lectures)***

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

***Module 5: Complex Variable – Integration: (8 lectures)***

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville‟s theorem and Maximum-Modulus theorem (without proof); Taylor‟s series, zeros of analytic functions, singularities, Laurent‟s series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

**Text/Reference Books**


1. Thomas, G. B. and Finney, R. L., Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint,2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. Boyce, W. E. and DiPrima, R. C., Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India,2009.
4. Ross, S. L., Differential Equations, 3rd Ed., Wiley India,1984.
5. Coddington, E. A., An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
6. Ince, E. L., Ordinary Differential Equations, Dover Publications,1958.
7. Brown, J. W., and Churchill, R. V., Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.
8. Bali, N. P., and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint,2008.
9. Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.

**Subject Name: Introduction to C Programming  Subject Code: BTCCSESC201  Subject Credit: 3**

**Course Objectives:**

- Formulating algorithmic solutions to problems and implementing algorithms in C.
- Notion of Operation of a CPU, Notion of an algorithm and computational procedure, editing and executing programs in Linux.
- Understanding branching, iteration and data representation usingarrays.
- Modular programming and recursive solution formulation.
- Understanding pointers and dynamic memory allocation.
- Understanding miscellaneous aspects of C.
- Comprehension of file operations.

**Course Outcomes:**

The student will learn:

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

***Module 1:***

Introduction to Programming **(4 lectures)**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture).**

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo code with examples. **(1 lecture)**

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

***Module 2:***

Arithmetic expressions and precedence **(2 lectures)**

Conditional Branching and Loops **(6 lectures)**

Writing and evaluation of conditionals and consequent branching **(3 lectures)**

Iteration and loops **(3 lectures)**

***Module 3:***

Arrays **(6 lectures)**

Arrays (1-D, 2-D), Character arrays and Strings

***Module 4:***

Basic Algorithms **(6 lectures)**

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

***Module 5:***

Function **(5 lectures)**

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

***Module 6:***

Recursion **(4 -5 lectures)**

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

Quick sort or Merge sort.

***Module 7:***

Structure **(4 lectures)**

Structures, Defining structures and Array of Structures

***Module 8:***

Pointers **(2 lectures)**

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

***Module 9:***

File handling (only if time is available, otherwise should be done as part of the lab)

**Text/ Reference Books**


1. Gottfried, B., Schaum's Outline of Programming with C,McGraw-Hill
2. Balaguruswamy, E., Programming in ANSI C, TataMcGraw-Hill
3. Kernighan, B. W. and Ritchie, D. M., The C Programming Language, Prentice Hall ofIndia

| Subject Name: Chemistry Lab | Subject Code: BTCCSBSC201 | Subject Credit: 1.5 |
|---|---|---|

**Laboratory Objectives:**

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

**Laboratory Outcomes**

The students will learn to:

- Estimate rate constants of reactions from concentration of reactants/products as a function oftime
- Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc

•Synthesize a small drug molecule and analyse

saltsample

• **Choice of 10-12 experiments from the following:**

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of areaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs

9. Synthesis of apolymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of asalt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscibleliquids
16. Adsorption of acetic acid bycharcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Subject Name: Introduction to C Programming Subject Code: BTCCSESC201 Subject Credit: 2**

**Laboratory Objectives:**

The laboratory course will consist of lab illustrating the principles of programming relevant to the study of science and engineering.

**Laboratory Outcomes:**

- To formulate the algorithms for simpleproblems
- To translate given algorithms to a working and correctprogram
- To be able to correct syntax errors as reported by thecompilers
- To be able to identify and correct logical errors encountered at runtime
- To be able to write iterative as well as recursiveprograms
- To be able to represent data in arrays, strings and structures and manipulate them through aprogram

- To be able to declare pointers of different types and use them in defining self referentialstructures.
- To be able to create, read and write to and from simple textfiles.

**[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]**

**Tutorial 1:** Problem solving using computers:

**Lab1:** Familiarization with programming environment

**Tutorial 2:** Variable types and type conversions:

**Lab 2:** Simple computational problems using arithmetic expressions

**Tutorial 3:** Branching and logical

expressions:

**Lab 3**: Problems involving if-then-else

structures

**Tutorial 4:** Loops, while and for loops:

**Lab 4:** Iterative problems e.g., sum of series

**Tutorial 5:** 1D Arrays: searching, sorting:

**Lab 5:** 1D Array manipulation

**Tutorial 6:** 2D arrays and Strings

**Lab 6:** Matrix problems, String operations

**Tutorial 7:** Functions, call by value:

**Lab 7:** Simple functions

**Tutorial 8 &9:** Numerical methods (Root finding, numerical differentiation, numerical integration):

**Lab 8 and 9:** Programming for solving Numerical methods problems

**Tutorial 10:** Recursion, structure of recursive calls

**Lab 10:** Recursive functions

**Tutorial 11:** Pointers, structures and dynamic memory allocation

**Lab 11:** Pointers and

structures

**Tutorial 12:** File

handling:

**Lab 12:** File operations

**Subject Name: Workshop Practices Subject Code: BTCCSESC202 Subject Credit: 2**

**Course Objectives:**

To impart hands-on training on basic engineering trades and skills.

**Course Outcomes:**

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

**Detailed Contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3lectures)**
2. CNC machining, Additive manufacturing **(1lecture)**

3. Fitting operations & power tools **(1lecture)**
4. Electrical & Electronics **(1 lecture)**
5. Carpentry **(1lecture)**
6. Plastic moulding, glass cutting **(1lecture)**
7. Metal casting **(1lecture)**
8. Welding (arc welding & gas welding), brazing

**(1 lecture) Text/ReferenceBooks:**


1. Hajra Choudhury, S. K., Hajra Choudhury A. K. and Nirjhar Roy S. K., Elements of Workshop Technology, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited,Mumbai.
2. Kalpakjian, S., and Steven S. S., Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition,2002.
3. Gowri, P., Hariharan and Suresh Babu, A., Manufacturing Technology – I, Pearson Education,2008.
4. Roy A. Lindberg, Processes and Materials of Manufacture, 4th Edition, Prentice Hall India,1998.


**Laboratory Objectives:**

To impart hands-on practice on basic engineering trades and skills.

**Laboratory Outcomes:**

Upon completion of this laboratory course, students will be able to

- Fabricate components with their ownhands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

**(ii) Workshop Practice: (60 hours) [ L : 0; T:0 ; P : 4 (2 credits)]**

**1.** Machine shop **(10hours)**

**2.** Fitting shop **(8hours)**

**3.** Carpentry **(6hours)**

**4.** Electrical & Electronics **(8 hours)**

**5.** Welding shop **( 8 hours (Arc welding 4 hrs + gas welding 4hrs)**

**6.** Casting **(8hours)**

**7.** Smithy **(6hours)**

8. Plastic moulding & Glass Cutting (6hours)

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

# 3rd Semester

**Subject Name: Economics For Engineers  Subject Code: BTCCSHSMC301  Subject Credit: 3**

**Course Objectives:**

1) Understand the role and scope of Engineering Economics and the process of economic decision making
2) Understand the different concepts of cost and different cost estimation techniques
3) Familiarization with the concepts of cash flow, time value of money and different interest formulas
4) Appreciation of the role of uncertainty in future events and using different concepts from probability to deal with uncertainty
5) Understand the concepts of Depreciation and Replacement analysis along with their methods of calculation
6) Familiarization with the phenomenon of inflation and the use of price indices in engineering Economics
7) Introduction to basic concepts of Accounting and Financial Management

**Course Outcomes:**

On completion of the course students will be able to

1) Make different economic decisions and estimate engineering costs by applying different cost estimation models.
2) Create cash flow diagrams for different situations and use different interest formulae to solve associated problems.
3) Take decisions regarding different engineering projects by using various criteria like rate of return analysis, present worth analysis, cost-benefit analysis etc.
4) Incorporate the effect of uncertainty in economic analysis by using various concepts like expected value, estimates and simulation.
5) Understand the concepts of depreciation and replacement analysis and solve associated problems.
6) Understand the process of inflation and use different price indices to adjust for its effect.
7) Apply the various concepts of Accounting like balance sheet and ratio analysis.
8) Understand the scope of Finance and the role of financial planning and management.

***Module 1:***

Economic Decisions Making – Overview, Problems, Role, Decision making process.

Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - PerUnit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits

***Module 2:***

Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment,

Nominal& Effective Interest.

Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector – Quantifying And Valuing Benefits & drawbacks.

***Module 3:***

Inflation and Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.
Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.
Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.

***Module 4:***

Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation and Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances.

Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems.

Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.

**Text/Reference Books:**

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.PaneerSeelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House (AICTE Recommended Textbook – 2018)

| Subject Name: Biology | Subject Code: BTCCSBSC301 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

Identify the characteristics and basic needs of living organisms and ecosystems. Explain the processes of growth and development in individuals and populations. Design and critically assess the scientific investigations they perform. Demonstrate critical thinking skills.

**Course Outcomes:**

After studying the course, the student will be able to:

- Describe how biological observations of 18th Century that lead to major discoveries.
- Convey that classification per se is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
- Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
- Classify enzymes and distinguish between different mechanisms of enzyme action.
- Identify DNA as a genetic material in the molecular basis of information transfer.
- Analyse biological processes at the reductionistic level Apply thermodynamic principles to biological systems.
- Identify and classify microorganisms

***Module 1. Introduction***

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

***Module 2. Classification***

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus

***Module 3.Genetics***

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

***Module 4. Biomolecules***

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

***Module 5. Enzymes***

Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

***Module 6. Information Transfer***

DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

***Module 7. Macromolecular analysis***

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

***Module 8. Metabolism***

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to $CO_2 + H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

***Module 9. Microbiology***

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

**Text / Reference Books:**

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons

3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

## Subject Name: Mathematics-III Subject Code: BTCCSBSC302 Subject Credit: 4

**Course Objectives:**

The objective of this course is to familiarize the prospective engineers with techniques in numerical analysis, linear algebra and statistics. It aims to equip the students with standard concepts and different tools of numerical methods, linear algebra and statisticsat an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines

**Course Outcomes:**

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

1. Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions.
2. Apply numerical methods to obtain approximate solutions to mathematical problems.
3. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.
4. Deal with system of linear equations which are essential in most branches of engineering.
5. Use the essential tool of matrices and linear algebra in a comprehensive manner.
6. Understand crucial topics in statistics including - data gathering, summarizing data using descriptive statistics, displaying and visualizing data.
7. Examining relationships between variables, probability distributions, expected values.
8. Use hypothesis testing, regression and correlation analysis.

**Numerical Methods**

Introduction: Approximation of numbers, significant figures, rounding off errors, addition, subtraction, multiplication and division, loss of significant figures, inherent errors Truncation and rounding errors, propagation of errors ordinary and divided differences.

Interpolation: Newton's forward interpolation, Newton's backward interpolation, Lagrange's interpolation formula, Newton's divided difference formula.

Numerical solution of transcendental and polynomial equations: Fixed point iteration method, Regula-Falsi method, Newton-Raphson method, rate of convergence of these methods.

Numerical solution of a system of linear algebraic equations: Gauss elimination method, LU Decomposition method, Gauss-Seidel method.

Numerical integration: Gauss quadrature formula, Newton Cotes formula, Trapezoidal rule, Simpson's 1/3rd rule, Composite Trapezoidal rule, Composite Simpson's 1/3rd rule.

Numerical solution of ordinary differential equation: Picard's method, Runge-Kutta methods of order two and four.

**Linear Algebra**

Preliminary concepts of matrices and determinants: Basic definitions and operations on matrices and determinants with examples, inverse of a matrix, characterizations of invertible matrices, rank of matrices, eigen value, eigenvector, properties of eigen value and eigen vector,characteristic equation of a matrix, Caley-Hamilton theorem and its applications.

Vector space: Definition, examples, linearly dependent and independent vectors, subspace, span of a subset, basis, dimensions, existence of solutions of homogeneous and non-homogeneous system of linear equations and determination of their solution.

Linear transformation: Definitions, examples, algebra of linear transformation, properties of linear transformation,matrix of a linear transformation.

**Statistics**

Probability: Random Numbers, the basic concepts and application of probability and probability distributions, mean, variance, covariance,different types of probability distributions.

Statistics: Types of Data, Measure of Central Tendency- mean, median, mode, Measure of Dispersion- variance, and standard deviation, visualization Fundamentals, different types of visualization depending on the type of data and information, different measures of Statistics by Groups, Statistical Charts/ graphs, theory of estimation, confidence interval, hypothesis testing, Simple linear regression and its properties

**Text Books/ Reference Books:**


1. C.Xavier: C Language and Numerical Methods.
2. Dutta& Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar ,& Jain: Numerical Methods (Problems and Solution).
5. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
6. SoumenGuha& Rajesh Srivastava: Numerical Methods, OUP.
7. David C. Lay, Linear Algebra and its Applications, 3rd Ed., Pearson Education Asia, Indian Reprint, 2007.
8. K.B. Dutta, Matrix and linear algebra.
9. K. Hoffman, R. Kunze, Linear algebra.
10. W.S. Burnstine and A.W. Panton, Theory of equations

11. Goon, A.M., Gupta, M.K. and Dasgupta, B. (2002): Fundamentals of Statistics, Vol. I& II, 8th Edn. The WorldPress, Kolkata.
12. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7thEdn.), Pearson Education, Asia.
13. Mood, A.M., Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn. (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
14. Freedman, D., Pisani, R. and Purves, R.( 2014): Statistics, 4th Edition, W. W. Norton & Company.

**Subject Name: Principle Of Communication Engineering Subject Code: BTCCSESC301 Subject Credit: 3**

**Course Objectives:**

The aim of this course is to introduce the students to the basic concepts of communication systems.

**Course Outcomes:**

After undergoing the subject, students will be able to:

- Explain the concept and need of modulation and demodulation
- Measure the modulation index of the Amplitude Modulated wave and frequency deviation of FM.
- Use different types of modulators and demodulators.
- Use different types of Pulse Modulation Techniques

***Module I***

Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver

***Module II***

Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, Bandwidth of FM Signals using Bessel's Function, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting.

***Module III***

Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, Digital Representation of Analog Signals Pulse Code Modulation (PCM), PCM System Issues in digital transmission: Frequency Division Multiplexing Time Division Multiplexing, T1 Digital System, TDM Hierarchy

***Module IV***

Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.

***ModuleV***

Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.

**Text Book:**

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill.
2. Rishabh Anand, Communication Systems, Khanna Publishing House, Delhi

**Reference Books:**

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
3. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill.

## Subject Name: Analog And Digital Electronics Subject Code: BTCCSESC302 Subject Credit: 3

**Course Objectives:**

The objective of this course is to give students an introduction to basic analog and digital electronics to applications to shape their future careers as engineers.

**Course Outcomes:**

After undergoing the subject, students will be able to:

- compare the merits and demerits of the different amplifiers and must be able to bias the transistors accordingly;
- design multivibrator circuits using 555 timers
- convert from one number system to another, work out problems related to Boolean algebra, minimisation problems etc.
- differentiate between the combinational and sequential circuits and design simple circuits

***Module I***

1. Different Classes of Amplifiers - Class-A, B, AB and C - basic concepts, power, efficiency;

Recapitulation of basic concepts of Feedback and Oscillation, Phase Shift, Wein Bridge oscillators.
2. Astable & Monostable Multivibrators; Schimtt Trigger circuits, 555 Timer.

***Module II***

1. Binary Number System & Boolean Algebra; BCD, ASCII, EBDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods, Binary arithmetic, Venn diagram, Boolean algebra; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method.
2. Combinational circuits - Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator

***Module III***

1. Sequential Circuits - Basic Flip-flop & Latch. Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops
2. Registers (SISO, SIPO, PIPO, PISO), Ring counter, Johnson counter, Basic concept of Synchronous and Asynchronous counters (detail design of circuits excluded), Design of Mod N Counter

***Module IV***

1. A/D and D/A conversion techniques – Basic concepts (D/A :R-2-R only A/D: successive approximation )
2. Logic families- TTL, ECL, MOS and CMOS - basic concepts. [Learning Outcome: The student must be able to)

**Textbooks:**


1. Microelectronics Engineering - Sedra& Smith-Oxford.
2. Principles of Electronic Devices & circuits—B L Thereja&Sedha—S Chand
3. Digital Electronics – Kharate – Oxford
4. Digital Electronics – Logic & Systems by J.Bigmell&R.Donovan; Cambridge Learning.
5. Digital Logic and State Machine Design (3rd Edition) – D.J.Comer, OUP


## Subject Name: Data Structures and Algorithms Subject Code: BTCCSPCC301 Subject Credit: 3

**Course Objectives:**

The objective of this course is to introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.

**Course Outcomes:**

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.

3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

***Module I: Introduction: Basic Terminologies***

Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

***Module II: Stacks and Queues***

ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

***Module III:***

***Linked Lists:***

Singly linked lists, Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

***Trees:***

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

***Module IV:***

***Sorting and Hashing:***

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

***Graph:***

Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

**Textbooks:**


1. “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. “Data Structures And Program Design In C”, 2/E by Robert L. Kruse, Bruce P. Leung.
3. “Fundamentals of Data Structures of C” by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed.
4. “Data Structures in C” by Aaron M. Tenenbaum. 4. “Data Structures” by S. Lipschutz.
5. “Data Structures Using C” by Reema Thareja.
6. “Data Structure Using C”, 2/e by A.K. Rath, A. K. Jagadev.
7. “Introduction to Algorithms” by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.

**Subject Name: Discrete Mathematics  Subject Code: BTCCSPCC302  Subject Credit: 3**

**Course Objectives:**

Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Use counterexamples.
5. Apply logical reasoning to solve a variety of problems

**Course Outcomes:**

1. For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
2. For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
3. For a given a mathematical problem, classify its algebraic structure
4. Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
5. Develop the given problem as graph networks and solve with techniques of graph theory.

***Module 1:***

**Sets, Relation and Function:**

Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

**Principles of Mathematical Induction:**

The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

**Module 2:**

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

**Module 3:**

**Propositional Logic:**

Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers.

**Proof Techniques:**

Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

**Module 4:**

**Algebraic Structures and Morphism:**

Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form **Module 5:**

**Graphs and Trees:**

Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

**Texts:**

1. Russell Merris, Combinatorics, Wiley-Interscience series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang – Introduction to Graph Theory, TMH

**References:**

5. J.K. Sharma, Discrete Mathematics, Macmillan
6. Winfried Karl Grassmann and Jean-Paul Tremblay, Logic and Discrete Mathematics, PEARSON.
7. S. K. Chakraborty and B. K. Sarkar, Discrete Mathematics, OXFORD University Press.
8. Douglas B. West, Introduction to graph Theory, PHI

**Subject Name: Environmental Sciences Subject Code: BTCCSMC30 Subject Credit: 0**

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two types of activities.

**Awareness Activities:**

i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.

ii. Slogan makingevent.

iii. Poster makingevent.

iv. Cycle rally.

v. Lectures fromexperts.

**Actual Activities:**

i. Plantation

ii. Gifting a tree to see its fullgrowth

iii. Cleanlinessdrive

iv. Drive for segregation ofwaste

v. To live some big environmentalist for a week or so to understand hiswork

vi. To work in kitchen garden formess

vii. To know about the different varieties ofplants

viii. Shutting down the fans and ACs of the campus for an hour orso

**Innovation**

**Subject Name: Analog and Digital Electronics Lab Subject Code: BTCCSESC302 Subject Credit:1**

**Laboratory Objectives:**

This laboratory course enables students to get practical experience in design, assembly and evaluation/testing of

1. Analog components and circuits including Operational Amplifier, Timer, etc.
2. Combinational logic circuits.
3. Flip - Flops and their operations

4. Counters and registers using flip-flops.
5. Synchronous and Asynchronous sequential circuits.
6. A/D and D/A converters

**Laboratory Outcomes**

On the completion of this laboratory course, the students will be able to:

1. Use various Electronic Devices like Cathode ray Oscilloscope, Signal generators, Digital Trainer Kit, Multimeters and components like Resistors, Capacitors, Op amp and Integrated Circuit.
2. Design and demonstrate various combinational logic circuits.
3. Design and demonstrate various types of counters and Registers using Flip-flops
4. Use simulation package to design circuits.
5. Understand the working and implementation of ALU.

**Choice of 10-12 experiments from thefollowing:**

1. a) Design and construct a Schmitt trigger using Op-Amp for given UTP and LTP values and demonstrate its working.
b) Design and implement a Schmitt trigger using Op-Amp using a simulation package for two sets of UTP and LTP values and demonstrate its working.
2. a) Design and construct a rectangular waveform generator (Op-Amp relaxation oscillator) for given frequency and demonstrate its working.
b) Design and implement a rectangular waveform generator (Op-Amp relaxation oscillator) using a simulation package and demonstrate the change in frequency when all resistor values are doubled.
3. Design and implement an Astable multivibrator circuit using 555 timer for a given frequency and duty cycle.
4. Design and implement Half adder, Full Adder, Half Subtractor, Full Subtractor using basic gates.
5. a) Given a 4-variable logic expression, simplify it using Entered Variable Map and realize the simplified logic expression using 8:1 multiplexer IC.
b) Design and develop the Verilog /VHDL code for an 8:1 multiplexer. Simulate and verify its working.
6. a) Design and implement code converter I)Binary to Gray (II) Gray to Binary Code using basic gates.
7. Design and verify the Truth Table of 3-bit Parity Generator and 4-bit Parity Checker using basic Logic Gates with an even parity bit.
8. a) Realize a J-K Master / Slave Flip-Flop using NAND gates and verify its truth table.
b) Design and develop the Verilog / VHDL code for D Flip-Flop with positive-edge triggering. Simulate and verify it's working.
9. a) Design and implement a mod-n (n<8)synchronous up counter using J-K Flip- Flop ICs and demonstrate its working.
b) Design and develop the Verilog / VHDL code for mod-8 up counter. Simulate and verify its working
10. Design and implement an asynchronous counter using decade counter IC to count up from 0 to n (n<=9) and demonstrate on 7-segment display (using IC- 7447).
11. Generate a Ramp output waveform using DAC0800 (Inputs are given to DAC through IC74393 dual 4-bit binary counter

**Subject Name: Data Structure and Alorithm Lab Subject Code: BTCCSESC302 Subject Credit:2**

**Laboratory Objectives:**

This is a companion lab of the Data Structures and Algorithms course. In this course, the students will learn to implement basic data structures in C/C++ and to use them for implementing some of the standard algorithms they learned in the theory course. A sample offering is given below.

Iterative and recursive algorithms such as linear search, binary search, Towers of Hanoi and Euclid's GCD algorithm.

Selection sort, insertion sort, quicksort, external merge sort.

Linked lists - single and doubly linked lists, queue and stack using linked lists.

Binary trees, binary search trees, expression trees and infix-postfix conversion.

Heaps and priority queues using min/max heaps. Graphs - representations and traversals.

**Laboratory Outcomes**

1. To be able to implement basic data structures and some of their standard applications.
2. To develop the ability to design and implement simple algorithms using the appropriate data structure learned in the course.

**Computations on arrays –**

binary search, bubble sort, insertion sort, quick sort, external merge sort, heaps and heap sort, priority queues using heaps.

**Linked lists –**

single and doubly linked lists.

**Queue and Stack data structures –**

array based and linked list based implementations. Infix to postfix conversion and expression evaluation.

**Trees & Graphs –**

Adjacency matrix and adjacency list representations, DFS, BFS. Binary Trees, Tree traversals, Binary search trees, B-Trees

# 4th Semester

**Subject Name: Universal Human Values II :Understanding Harmony  Subject Code: BTCCSHSMC401  Subject Credit:3**

**Course Objectives:**

1. To create an awareness on Engineering Ethics and Human Values.
2. To understand social responsibility of an engineer.
3. To appreciate ethical dilemma while discharging duties in professional life.

**Course Outcomes:**

On completion of this course, the students will be able to

1. Understand the significance of value inputs in a classroom and start applying them in their life and profession
2. Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
3. Understand the role of a human being in ensuring harmony in society and nature.
4. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

**Detailed Syllabus**

**UNIT I: Introduction to Value Education**

1. Value Education, Definition, Concept and Need for Value Education.
2. The Content and Process of Value Education.
3. Basic Guidelines for Value Education.
4. Self exploration as a means of Value Education.
5. Happiness and Prosperity as parts of Value Education.

**UNIT II: Harmony in the Human Being**

1. Human Being is more than just the Body.
2. Harmony of the Self ('I') with the Body.
3. Understanding Myself as Co-existence of the Self and the Body.
4. Understanding Needs of the Self and the needs of the Body.
5. Understanding the activities in the Self and the activities in the Body.

**UNIT III: Harmony in the Family and Society and Harmony in the Nature**

1. Family as a basic unit of Human Interaction and Values in Relationships.
2. The Basics for Respect and today's Crisis: Affection, e, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour.
3. Harmony in Nature: The Four Orders in Nature.
4. The Holistic Perception of Harmony in Existence.

**UNIT IV: Social Ethics**

1. The Basics for Ethical Human Conduct.
2. Defects in Ethical Human Conduct.
3. Holistic Alternative and Universal Order.
4. Universal Human Order and Ethical Conduct.
5. Human Rights violation and Social Disparities.

**UNIT V: Professional Ethics**

1. Value based Life and Profession.
2. Professional Ethics and Right Understanding.
3. Competence in Professional Ethics.
4. Issues in Professional Ethics – The Current Scenario.
5. Vision for Holistic Technologies, Production System and Management Models.

**Text Books/ Reference Books:**


1. A.N Tripathy, New Age International Publishers, 2003.
2. .Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3. Bertrand Russell Human Society in Ethics & Politics

**Subject Name: Computer Organization and Architecture Subject Code: BTCCSPCC401 Subject Credit:3**

**Course Objectives:**

To expose the students to the following:
1. How Computer Systems work & the basic principles
2. Instruction Level Architecture and Instruction Execution
3. The current state of art in memory system design
4. How I/O devices are accessed and its principles.
5. To provide the knowledge on Instruction Level Parallelism
6. To impart the knowledge on micro programming
7. Concepts of advanced pipelining techniques.

**Course Outcomes:**

1. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
3. Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
5. Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

Detailed contents:

**Module 1**

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs. Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

**Module 2**

Introduction to x86 architecture. CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Memory system design: semiconductor memory technologies, memory organization. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

**Module 3:**
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.
Module 4: Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies

**Text Books**

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2. "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

**Reference Books:**
1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill

2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

**Subject Name: Database Management System Subject Code: BTCCSPCC402 Subject Credit:3**

**Course Objectives:**

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

**Course Outcomes:**

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement design the databases using ER method and normalization.

3. For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

**Detailed contents**

**Module 1:**

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

**Module 2:**

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

**Module 3:**

Storage strategies: Indices, B-trees, hashing.

**Module 4:**

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

**Module 5:**

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

**Module 6:**

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

***Text Books***

1. “Database System Concepts”, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

***Reference Books:***

4. “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press.
5. “Fundamentals of Database Systems”, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
6. “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

**Subject Name: Design and Analysis of Algorithm  Subject Code: BTCCSPCC403  Subject Credit:3**

**Course Objectives:**

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

**Course Outcomes:**

1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms .
2. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming
5. develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
6. For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
7. Explain the ways to analyze randomized algorithms (expected running time, probability of error).
8. Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

**Detailed contents:**

**Module 1:**

Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

**Module 2:**

Fundamental Algorithmic Strategies: Brute-Force, Greedy,Dynamic Programming, Branchand-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics

– characteristics and their application domains.

**Module 3:**

Graph and Tree Algorithms: Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

**Module 4:**

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Module 5:

Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

**Text Books:**

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

**Reference Books:**

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

| **Subject Name: Data Analysis and Visualization** | **Subject Code: BTCCSPEC401** | **Subject Credit:3** |
|---|---|---|

**Course Objectives:**

1. The basic objective is to understand the data analysis & visualize your data & method, understanding models not just a tool-oriented Analyst.

**Course Outcomes:**

1. Understand knowledge of data analysis & visualization.
2. Job profiles come out after completion of that program is Data analyst, Business Analyst, Business Intelligence, Data Scientist, Data Architect, Data Statistician, Database Administrator, Data & Analytics manager etc.(Tools req- Microsoft office 2013/16 version, Tableau desktop, Power BI etc .

**Detailed contents**

**Module 1*:* INTRODUCTION TO DATA HANDLING**

Overview of Data analysis, Introduction to Data visualization, Working with statistical formulas - Logical and financial functions , Data Validation & data models, Power Map for visualize data , Power BI-Business Intelligence , Data Analysis using statistical methods, Dashboard designing..

**Module 2: INTRODUCTION TO DATA MANIPULATION USING FUNCTION**

Heat Map, Tree Map, Smart Chart,Azure Machine learning , Column Chart, Line Chart , Pie,Bar, Area, Scatter Chart, Data Series, Axes , Chart Sheet , Trendline , Error Bars, Sparklines, Combination Chart, Gauge, Thermometer Chart , Gantt Chart , Pareto Chart etc , Frequency Distribution, Pivot Chart, Slicers , Tables: Structured References, Table Styles , What-If Analysis: Data Tables, Goal Seek, Quadratic Equation , Transportation Problem, Maximum Flow Problem, Sensitivity Analysis, Histogram, Descriptive, Statistics, Anova, F-Test, t-Test, Moving,Average, Exponential Smoothing | Correlation model | Regression model, Practical Lab.

**Module 3: TABLEAU SOFTWARE: GETTING STARTED WITH TABLEAU SOFTWARE**

What is Tableau? What does the Tableau product suite comprise of? How Does Tableau Work? Tableau Architecture, What is My Tableau Repository? Connecting to Data & Introduction to data source concepts, Understanding the Tableau workspace, Dimensions and Measures, Data Types & Default Properties, Building basic views, Saving and Sharing your work-overview, Practical Lab

**Module 4: *TABLEAU: BUILDING VIEWS (REPORTS):***

Date Aggregations and Date parts, Cross tab & Tabular charts, Totals & Subtotals, Bar Charts & Stacked Bars, Trend lines, Forecasting, Filters, Context filters, Line Graphs with Date & Without Date, Tree maps, Scatter Plots.

**Module 5:**

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

**Module 6:**

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining .

***Text/Reference Books:***


1. "Information Dashboard Design: Displaying Data for At-a-glance Monitoring‖ by Stephen Few
2. "Beautiful Visualization, Looking at Data Through the Eyes of Experts by Julie Steele, Noah Iliinsky"
3. "The Accidental Analyst: Show Your Data Who_s Boss‖ byEileen and Stephen McDaniel

**Subject Name: Computer Graphics Subject Code: BTCCSPEe402 Subject Credit:3**

**Course Objectives:**

The course introduces the basic concepts of computer graphics. It provides the necessary theoretical background and demonstrates the application of computer science to graphics. The course further allows students to develop programming skills in computer graphics through programming assignments.

**Course Outcomes:**

At the end of the course, the students are expected to:

a) Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
b) Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
c) Use of geometric transformations on graphics objects and their application in composite form.
d) Extract scene with different clipping methods and its transformation to graphics display device.
e) Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
f) Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

**Module I**

**Introduction to computer graphics & graphics systems**

Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.

**Scan conversion**

Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.

**Module II**

**2D transformation & viewing**

Basic transformations: translation , rotation, scaling ; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines , parallel lines, intersecting lines. Viewing pipeline, Window to viewport co-ordinate transformation , clipping operations , point clipping , line clipping, clipping circles , polygons & ellipse.

**3D transformation & viewing**

3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, viewport clipping, 3D viewing.

**Module III**

**Curves**

Curve representation, surfaces , designs , Bezier curves , B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.

**Hidden surfaces**

Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods , fractal - geometry.

**Color & shading models**

Light & color model; interpolative shading model; Texture;

**Text Books:**

1. Hearn, Baker – " Computer Graphics ( C version 2nd Ed.)" – Pearson education
2. Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH
3. D. F. Rogers, J. A. Adams – " Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH
4. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI
5. Mukherjee Arup, Introduction to Computer Graphics, Vikas
6. Hill,Computer Graphics using open GL, Pearson Education

**Reference Books:**

1. Foley, Vandam, Feiner, Hughes – "Computer Graphics principles (2nd Ed.) – Pearson Education.
2. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – TMH.

**Subject Name: Microprocessor and Microcontroller  Subject Code: BTCCSOEC401  Subject Credit:3**

**Course Objectives:**

1. Recall and apply a basic concept of digital fundamentals to Microprocessor based personal computer system.
2. Identify a detailed s/w & h/w structure of the Microprocessor.
3. Illustrate how the different peripherals (8255, 8253 etc.) Are interfaced with Microprocessor.
4. Distinguish and analyze the properties of Microprocessors & Microcontrollers.
5. Analyze the data transfer information through serial & parallel ports.
6. Train their practical knowledge through laboratory experiments.

**Course Outcomes:**

At the end of the course, the students are expected to have

1. Hardware details of 8085 microprocessor with the related signals and their implications.
2. Concept of programming and interfacing of 8085.
3. Understanding of the difference between the architecture of 8085 and 8086.
4. Awareness of the 8051 architecture and its programming.
5. Basic idea on PIC microcontroller (16F877)

**Detailed contents**

**Module -1:**

Introduction to Microcomputer based system. History of evolution of Microprocessor and Microcontrollers and their advantages and disadvantages. Architecture of 8085 Microprocessor, Pin description of 8085. Address/data bus Demultiplexing , Status Signals and the control signals. Instruction set of 8085 microprocessor, Addressing modes, Timing diagram of the instructions (a few examples).

**Module -2:**

Assembly language programming with examples, Counter and Time Delays, Stack and Subroutine, Interrupts of 8085 processor(software and hardware), I/O Device Interfacing-I/O Mapped I/O and Memory Mapped I/O , Serial (using SID and SOD pins and RIM, SIM Instructions) and Parallel data transfer,

**Module 3:**

The 8086 microprocessor- Architecture, Addressing modes, Interrupts Introduction to 8051 Microcontroller –Architecture, Pin Details. Addressing modes, Instruction set, Examples of Simple Assembly Language.

**Module -4:**
Memory interfacing with 8085, 8086 Support IC chips- 8255 ,8251,8237/8257,8259 Interfacing of 8255 PPI with 8085 and Microcontroller 8051. Brief introduction to PIC microcontroller (16F877)

***Text/Reference Books:***

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan (Oxford university press)
2. 8051 Microcontroller – K. Ayala (Cengage learning)
3. MICROPROCESSOR architecture, programming and Application with 8085 - R.Gaonkar (Penram international Publishing LTD.)
4.Microcontrollers:Principles&Applications , Ajit Pal, PHI 2011.
5.Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing"Dhanpat Rai, 2003 6. 8051 Microprocessor –V. Udayashankara and M.S Mallikarjunaswami (TMH).
7. Microprocessor 8085 and its Interfacing—S Mathur (PHI) 8. An Introduction to Microprocessor and Applications –Krishna Kant (Macmillan)

**Subject Name: Operational Research Subject Code: BTCCSOEC402 Subject Credit: 3**

**Course Objectives:**

1. To impart knowledge in concepts and tools of Operations Research
2. To understand mathematical models used in Operations Research
3. To apply these techniques constructively to make effective business decisions

**Course Outcomes:**

At the end of the course, the students are expected to
1. Identify and develop operational research models from the verbal description of the real system.
2. Understand the mathematical tools that are needed to solve optimization problems.
3. Use mathematical software to solve the proposed models.
4. Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

**Detailed contents**

**Module I**
Linear Programming Problems (LPP): Basic LPP and Applications; Various Components of LP Problem Formulation. Solution of Linear Programming Problems: Solution of LPP: Using Simultaneous Equations and Graphical Method; Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non-degenerate Solution, Convex set and explanation with examples.

Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems.

**Module II**

Network Analysis: Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). Inventory Control: Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.

**Module III**

Game Theory: Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance.

**Module IV**

Queuing Theory: Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems

***Text/Reference Books:***


1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA
5. Kanti Swaroop — "Operations Research", Sultan Chand & Sons
6. Rathindra P. Sen—"Operations Research: Algorithms and Applications", PHI
7. R. Panneerselvam - "Operations Research", PHI


**Subject Name: Python Lab Subject Code: BTCCSPPC401 Subject Credit: 1**

**Lab Objectives:**

The objective of this course is to teach students the concepts of Python Programming Language with Libraries.

**Course Outcomes:**

On completion of this course, the students are expected to learn

1. Python programming, Data Structure.
2. Learn Libraries Numpy ,Pandas with the use of Data Analysis.

**Detailed Contents :**

**UNIT – I**

**Python programming Basic:**

Python interpreter, IPython Basics, Tab completion, Introspection, %run command, magic commands, matplotlib integration, python programming, language semantics, scalar types. Control flow

**Data Structure, functions, files:**

tuple, list, built-in sequence function, dict, set, functions, namescape, scope, local function, returning multiple values, functions are objects, lambda functions, error and exception handling, file and operation systems

**UNIT – II**

**NumPy:**

Array and vectorized computation: Multidimensional array object. Creating ndarrays, arithmetic with numpy array, basic indexing and slicing, Boolean indexing, transposing array and swapping axes, universal functions, array-oriented programming with arrays, conditional logic as arrays operations, file input and output with array

**Pandas:**

Pandas data structure, series, DataFrame, Index Object, Reindexing, dropping entities from an axis, indexing, selection and filtering, integer indexes, arithmetic and data alignment, function application and mapping, soring and ranking, correlation and covariance, unique values, values controls and membership, reading and writing data in text format

**UNIT –III**

**Visualization with Matplotlib:**

Figures and subplots, colors, markers, line style, ticks, labels, legends, annotation and drawing on sublots, matplotlib configuration

**UNIT –IV**

**Plotting with pandas and seaborn:**

line plots, bar plots, histogram, density plots, scatter and point plots, facet grids and categorical dat

***Text/Reference Books:***


1. Learning Python: Powerful Object-Oriented Programming by Lutz M - Shroff; Fifth edition
2. Python: The Complete Reference by Martin C. Brown - McGraw Hill Education; Forth edition
3. Pandas for Everyone: Python Data Analysis by Daniel Y. Chen - Pearson Education; First edition

**Subject Name: Computer Organization an Architecture Lab** **Subject Code: BTCCSPCC401** **Subject Credit: 1**

**Laboratory Objectives:**

To expose the students about how the computer Systems work practically & the practical implementation of the basic principles

**Laboratory Outcomes**

On completion of the course students will be able

1. To implement adder circuits using basic gates
2. To understand the converter circuits using basic gates.
3. To understand the working of Multiplexer by using IC 74153
4. To understand the various circuits for ALU, data path and control units.

**Choice of 10-12 experiments from the following:**

1. Design the circuit of half adder.
2. Design the circuit of full adder.
3. Design the circuit of half subtractor.
4. Design the circuit of full subtractor.
5. Design an 8×1 multiplexer.
6. Design a 4 bit combinational shifter.
7. Design a bcd adder.
8. Design a 4-bit adder subtractor.
9. Design an ALU.
10. Design 2:4 decode

## Subject Name: Database Management System Lab  Subject Code: BTCCSPCC402  Subject Credit: 2

**Laboratory Objectives:**

Students will have the ability to:
• Introduce ER data model, database design and normalization
• Learn SQL basics for data definition and data manipulation

**Laboratory Outcomes**

Students will be able to demonstrate their skills to
• Design database schema for a given application and apply normalization
• Acquire skills in using SQL commands for data definition and data manipulation.
• Develop solutions for database applications using procedures, cursors and triggers

**Choice of 10-12 experiments from the following:**

1. Concept design with E-R Model
2. Relational Model 3. Normalization
4. Practicing DDL commands
5. Practicing DML commands
6. Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT, Constraints etc.)
7. Queries using Aggregate functions, GROUP BY, HAVING and Creation and dropping of Views.
8. Triggers (Creation of insert trigger, delete trigger, update trigger)
9. Procedures
10. Usage of Cursor

## Subject Name: Design and Analysis of Algorithm Lab  Subject Code: BTCCSPCC403  Subject Credit: 1

**Laboratory Objectives:**

- The principle objective of this course is to build solid foundation in algorithms and their applications.
- To implement various divide and conquer techniques examples.
- To implement various Greedy techniques examples.
- To implement various Dynamic Programming techniques examples.
- To provide a practical exposure of all algorithms.

- To understand the importance of algorithm and its complexities

**Laboratory Outcomes**

- Students will be able to calculate the time complexity of algorithm.
- Students will be able to sort the given numbers using various sorting algorithms.
- Students will be able to write programs for the problems using Divide and Conquer.
- Students will be able to write programs for the problems using Greedy Method.
- Students will be able to write programs for the problems using Dynamic programming.
- Students will be able to write programs for the problems using Backtracking

**Choice of 10-12 experiments from the following:**

1. Write a program to perform operation count for a given pseudo code
2. Write a program to perform Bubble sort for any given list of numbers.
3. Write a program to perform Insertion sort for any given list of numbers.
4. Write a program to perform Quick Sort for the given list of integer values.
5. Write a program to find Maximum and Minimum of the given set of integer values.
6. Write a Program to perform Merge Sort on the given two lists of integer values.
7. Write a Program to perform Binary Search for a given set of integer values recursively and non-recursively.
8. Write a program to find solution for knapsack problem using greedy method.
9. Write a program to find minimum cost spanning tree using Prim's Algorithm.
10. Write a program to find minimum cost spanning tree using Kruskal's Algorithm.

11. Write a program to perform Single source shortest path problem for a given graph.
12. Write a program to find solution for job sequencing with deadlines problem.
13. Write a program for all pairs shortest path problem.
14. Write a program to solve N-QUEENS problem.
15. Write a program to solve Sum of subsets problem for a given set of distinct number

# 5th Semester

| Subject Name: Artificial Intelligence | Subject Code: BTCCSPCC501 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

The objective of the course is to acquire knowledge on intelligent systems and agents, formalization of knowledge, reasoning with and without uncertainty, machine learning and applications at a basic level.

**Course Outcomes:**

Upon Completion of this course the student will be able to:

1. List the objectives and functions of modern Artificial Intelligence.
2. Categorize an AI problem based on its characteristics and its constraints.
3. Understand and implement search and adversarial (game) algorithms.
4. Learn different logic formalisms and decision taking in planning problems.
5. Demonstrate practical experience by implementing and experimenting with the learnt algorithms.

## Details:

**Introduction**

Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

**Intelligent Agents**

Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

**Problem Solving**

Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

**Search techniques**

Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

**Heuristic search strategies**

Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

**Adversarial search**

Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

**Knowledge & reasoning**
Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.
**Using predicate logic**
Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.
**Representing knowledge using rules**
Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.
**Probabilistic reasoning**
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.
**Planning**
Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.
**Natural Language processing**
Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.
**Learning**
Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.
**Expert Systems**
Representing and using domain knowledge, expert system shells, knowledge acquisition. Basic knowledge of programming language like **Prolog & Lisp.**

Books:
1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International
6. Expert Systems, Giarranto, VIKAS 7. Artificial Intelligence, Russel, Pearson

| Subject Name: Object Oriented Programming | Subject Code: BTCCSPCC502 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

The course will introduce standard tools and techniques for software development, using object-oriented approach, use of a version control system, an automated build process, an appropriate framework for automated unit and integration tests.

**Course Outcomes:**

After taking the course, students will be able to:

1. Specify simple abstract data types and design implementations, using abstraction functions to document them.
2. Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
3. Name and apply some common object-oriented design patterns and give examples of their use.
4. Design applications with an event-driven graphical user interface

**Detailed contents**

- Abstract data types and their specification.
- How to implement an ADT. Concrete state space, concrete invariant, abstraction function. Implementing operations, illustrated by the Text example.
- Features of object-oriented programming. Encapsulation, object identity, polymorphism – but not inheritance.
- Inheritance in OO design.
- Design patterns. Introduction and classification. The iterator pattern.
- Model-view-controller pattern.
- Commands as methods and as objects.
- Implementing OO language features.
- Memory management.
- Generic types and collections
- GUIs. Graphical programming with Scala and Swing
- The software development process.

The concepts should be practiced using C++ and Java.
Pearl may also be introduced wherever possible.

**Suggested books**

4. Barbara Liskov, Program Development in Java, Addison-Wesley, 2001

**Suggested reference books**

1. Any book on Core Java
2. Any book on C++

**Subject Name: Formal Language and Automata Theory Subject Code: BTCCSPCC503 Subject Credit: 3**

**Course Objectives:**

- Develop a formal notation for strings, languages and machines.
- Design finite automata to accept a set of strings of a language.
- Prove that a given language is regular and apply the closure properties of languages.
- Design context free grammars to generate strings from a context free language and convert them into normal forms.
- Prove equivalence of languages accepted by Push Down Automata and languages generated by context free grammars
- Identify the hierarchy of formal languages, grammars and machines.
- Distinguish between computability and non-computability and Decidability and undecidability

**Course Outcomes:**

1. Write a formal notation for strings, languages and machines.
2. Design finite automata to accept a set of strings of a language.
3. For a given language determine whether the given language is regular or not.
4. Design context free grammars to generate strings of context free language.
5. Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars
6. Write the hierarchy of formal languages, grammars and machines.
7. Distinguish between computability and non-computability and Decidability and undecidability.

## Detailed contents

**Introduction:**
Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.
**Regular languages and finite automata:** Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata.
**Context-free languages and pushdown automata:**

Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

**Context-sensitive languages:**

Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

**Turing machines:**

The basic model for Turing machines (TM), Turing-recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

**Undecidability:**

Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

**Suggested books**

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

**Suggested reference books:**

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill

## Subject Name: Data Mining Subject Code: BTCCSPCC504 Subject Credit: 3

**Course Objectives:**

1. Introduce data mining principles and techniques.
2. Introduce data mining as a cutting-edge business intelligence tool.
3. Develop and apply critical thinking, problem solving and decision-making skills.
4. Introduce the concepts of Data Warehousing, difference between database and data warehousing.
5. Describe and demonstrate basic data mining algorithms, methods, tools,
6. Describe ETL Model and the Star Schema to design a Data Warehouse.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Design a data warehouse or data mart to present information needed by the and can be utilized for managing clients.

2. Design and implement a quality data warehouse or data mart effectively and administer the data resources in such a way that it will truly meet management's requirements.
3. Evaluate standards and new technologies to determine their potential impact on your information resource for a large complex data warehouse/data mart.
4. Use data mining tools for projects and to build reliable products as per demand.

**COURSE CONTENT**

**Unit I**

Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning,Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction: -Data Cube Aggregation, Dimensionality reduction, Data 35 Com-pression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

**Unit II**

Concept Description: - Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Dis-plays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

**Unit III**

Classification and Predictions: What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

**Unit IV**

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi-Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

**Unit V**

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehous

**TEXT BOOKS**

1. H.Dunham,"DataMining:Introductory and Advanced Topics" Pearson Education.
2. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education.

**REFERENCE BOOKS**

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier.
2. Mallach,"Data Warehousing System",McGraw –Hill.

| **Subject Name: Cloud Computing** | **Subject Code: BTCCSPEC501** | **Subject Credit: 3** |
|---|---|---|

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domains from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

**Course Outcomes:**

The primary course outcomes of this course are five-fold. Students will be able to:
1) Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
2) Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, elastic and cost-efficient.
3) Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
4) Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
5) Analyze various cloud programming models and apply them to solve problems on the cloud.

**Detailed contents**

**Module 1: Definition of Cloud Computing and its Basics**

1. Definition of Cloud Computing: Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service models – Infrastructure as a Service, Platform as a Service, Software as a Service with examples of services/ service providers, Cloud Reference model Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing
2. Cloud Architecture: A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications,

Connecting to the Cloud by Clients
3. Services and Applications by Type IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)

**Module 2 : Use of Platforms in Cloud Computing**
1. Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including Application Delivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance
2. Concepts of Platform as a Service Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks
3. Use of Google Web Services Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service. 4. Use of Amazon Web Services Amazon Web Service components and services: Amazon Elastic Cloud, Amazon Simple Storage system, Amazon Elastic Block Store, Amazon SimpleDB and Relational Database Service
5. Use of Microsoft Cloud Services Windows Azure platform: Microsoft's approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services

**Module 3 : Cloud Infrastructure**
Types of services required in implementation – Consulting, Configuration, Customization and Support
1. Cloud Management An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle)
2. Concepts of Cloud Security Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)

**Module 4 : Concepts of Services and Applications**
1. Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs 2. Applications in the Cloud: Concepts of cloud transactions, functionality mapping, Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs
3. Cloud-based Storage: Cloud storage definition – Manned and Unmanned
4. Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services

***Text/Reference Books:***

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson

| Subject Name: Information Theory and Coding | Subject Code: BTCCSPEC502 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

1. To define and apply the basic concepts of information theory (entropy, channel capacity etc.)
2. To learn the principles and applications of information theory in communication systems
3. To study various data compression methods and describe the most common such methods
4. To understand the theoretical framework upon which error-control codes are built

**Course Outcomes:**

At the end of the course, students will be able to

1. Interpret and summarize the role of information theory and linear algebra in source coding and channel coding
2. Make use of various error control encoding and decoding techniques
3. Implement various error control techniques
4. Analyze the performance of error control codes.

**Detailed contents**

**Module1: Information Theory**

Introduction, Measure of information, Information content of message, Average Information content of symbols in Long Independent sequences, Average Information content of symbols in Long dependent sequences, Markov Statistical Model of Information Sources, Entropy and Information rate of Mark off Sources

**Module 2: Source Coding**

Source coding theorem, Kraft McMillan Inequality property –Encoding of the Source Output, Shannon FanoCodes, Huffman codes, Arithmetic Coding, Lempel – Ziv Algorithm

**Module 3: Information Channels**

Communication Channels, Channel Models, Channel Matrix, Joint probability Matrix, Binary Symmetric Channel, System Entropies, Mutual Information, Channel Capacity, Channel Capacity of :Binary Symmetric Channel, Binary Erasure Channel, Muroga's Theorem

**Module 4: Error Control Coding**

Introduction, Examples of Error control coding, methods of Controlling Errors, Types of Errors, types of Codes, Linear Block Codes: matrix description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes, Single ErrorCorrecting hamming Codes, Table lookup Decoding using Standard Array.Binary Cyclic Codes: Algebraic Structure of Cyclic Codes, Encoding using an (n-k) Bit Shift register, Syndrome Calculation, Error Detection and Correction

**Module 5: Some Important Cyclic Codes**
Golay Codes, BCH Codes, Convolution Codes: Convolution Encoder, Time domain approach, Transform domain approach, Code Tree, Trellis and State Diagram, The Viterbi Algorithm)

***Text/Reference Books:***


1. T. M. Cover, J. A. Thomas, “Elements of information theory”, Wiley
2. Reza, "An Introduction to Information Theory", Dover
3. R. W. Hamming, “Coding and information theory,” Prentice Hall Inc
4. Gravano Salvatore, “Error Correcting Codes” , Oxford University Press
5. Ranjan Bose, “Information Theory and Coding”, TMH
6. R. Hill, "A First Course in Coding Theory", Oxford University Press


**Subject Name: Software Engineering Subject Code: BTCCSPEC503 Subject Credit: 3**

**Course Objectives:**

- To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases.
- To provide an idea of using various process models in the software industry according to given circumstances.
- To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project

**Course Outcomes:**

At the end of the course, the students are expected to:

- Students will be able to decompose the given project in various phases of a lifecycle.
- Students will be able to choose appropriate process model depending on the user requirements.
- Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance
- Students will be able to know various processes used in all the phases of the product.
- Students can apply the knowledge, techniques, and skills in the development of a software product.

**Detailed contents**
**Module I**
Software Engineering –Objectives, Definitions ,Software Process models - Waterfall Model , Prototype model, RAD, Evolutionary Models ,Incremental, Spiral. Software Project Planning- Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model.
**Module II**
Structured Analysis , Context diagram and DFD, Physical and Logical DFDs ,Data Modelling, ER diagrams, Software Requirements Specification
**Module III**

Design Aspects :Top-Down And Bottom-Up design; Decision tree, decision table and structured English, Structure chart, Transform analysis Functional vs. Object- Oriented approach.

**Module IV**

Unified Modelling Language Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram.

**Module V**

Coding & Documentation – Structured Programming, Modular Programming, Module Relationship- Coupling, Cohesion, OO Programming, Information Hiding, Reuse, System Documentation. Testing – Levels of Testing, Integration Testing, System Testing. Software Quality, Quality Assurance, Software Maintenance, Software Configuration Management, Software Architecture.

***Text/Reference Books:***


1. Software Engineering : A practitioner's approach– Pressman(TMH)
2. Software Engineering- Pankaj Jalote (Wiley-India)
3. Software Engineering- Rajib Mall (PHI)
4. Software Engineering –Agarwal and Agarwal (PHI)


**Subject Name: Information Retrieval Subject Code: BTCCSPEC504 Subject Credit: 3**

- Learn to write code for text indexing and retrieval.
- Learn to evaluate information retrieval systems
- Learn to analyze textual and semi-structured data sets
- Learn to evaluate information retrieval systems
- Learn about text similarity measure
- Understanding about search engine
- Text Classification

**Course Outcomes:**

At the end of the course, the students are expected

- To Understand Document as Vector
- Performance evolution metric for IR
- To understand search Engine functionality

- Various Supervised and Unsupervised learning Method

**Detailed contents**

**Module 1: Overview of text retrieval systems**
Boolean retrieval, the term vocabulary and postings list, Dictionaries and tolerant retrieval, Index construction and compression

**Module 2: Retrieval models and implementation**

Vector Space Models, Vector Space Model, TF-IDF Weight, Evaluation in information retrieval
**Module 3: Query expansion and feedback**

Relevance feedback, pseudo relevance feedback, Query Reformulation

**Module 4: Probabilistic models; statistical language models**

Okapi/BM25; Language models, KL-divergence, Smoothing

**Module 5: Text classification & Text clustering**

The text classification problem, Naive Bayes text classification, k- nearest neighbors, Support vector Machine, Feature Selection, Vector-space clustering;

K-means algorithm, Hierarchical clustering, DBSCAN algorithm, PAM and PAMK, EM algorithm

**Module 6: Web search basics, crawling, indexes, Link analysis**
Web Characteristic, Crawling, Web As a graph, Page Rank, Hubs and Authorities

**Module 7: IR applications**

Information extraction, Question answering, Opinion summarization, Social Network

**Text/Reference Books:**


1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. 2008. http://nlp.stanford.edu/IR-book/information-retrieval-book.html
2. ChengXiangZhai, Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies), Morgan & Claypool Publishers, 2008.
3. http://www.morganclaypool.com/doi/abs/10.2200/S00158ED1V01Y200811HLT 001

| Subject Name: Introduction to R Programming | Subject Code: BTCCSPPC501 | Subject Credit: 1 |
|---|---|---|

**Laboratory Objectives:**

The objective of the course is to understand the R Programming Language.

**Laboratory Outcomes:**

At the end of the Course, the Student will be able to:

1: Show the installation of R Programming Environment.
2: Utilize and R Data types for developing programs.
3: Make use of different R Data Structures.
4: Develop programming logic using R Packages.
5: Analyze the datasets using R programming capabilities.

**Choice of 10-12 experiments from the following:**

1 Study of data analysis using MS-Excel(Prerequisite)
2 Download and install R-Programming environment and install basic packages using install.packages() command in R.
3 Study of basic Syntaxes in R
4 Implementation of vector data objects operations
5 Implementation of matrix, array and factors and perform va in R
6 Implementation and use of data frames in R
7 Create Sample (Dummy) Data in R and perform data manipulation with R
8 Study and implementation of various control structures in R
9 Data Manipulation with dplyr package
10 Data Manipulation with data.table package
11 Study and implementation of Data Visualization with ggplot2
12 Study and implementation data transpose operations in R
13 Implement data frames in R.
14 Write a program to join columns and rows in a data frame using cbind() and rbind() in R.
15 Implement different String Manipulation functions in R.
16 Implement different data structures in R (Vectors, Lists, Data Frames)
17 Write a program to read a csv file and analyze the data in the file in R
18 Create pie charts and bar charts using R.
19 Create a data set and do statistical analysis on the data using R.

**REFERENCES:**


1. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics,2 nd Edition, Pearson Education, 2018.
2. S. R. Mani Sekhar and T. V. Suresh Kumar, Programming with R,1 st Edition,, CENGAGE, 2017

| Subject Name: Artificial Intelligence Lab | Subject Code: BTCCSPCC501 | Subject Credit: 1 |
|---|---|---|

**Laboratory Objectives:**

The laboratory introduces Common Lisp and Prolog, reviews the fundamentals of symbolic programming, and considers such issues in AI

programming such as pattern matching, search, problem solving, and reasoning tasks.

**Laboratory Outcomes**

At the end of the course, the students are expected to:

1.Understand the methods of implementing algorithms using artificial intelligence techniques
2. Illustrate search algorithms
3. Understand the building of intelligent agents

**Choice of 10-12 experiments from the following:**

1 Study of Prolog and LISP
2 Write simple fact for the statements using PROLOG.
3 Write predicates One converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.
4 Write a program to solve the Monkey Banana problem.
5 WAP in turbo prolog for medical diagnosis and show the advantage and disadvantage of green and red cuts.
6 WAP to implement factorialof a given number.
7 WAP to get Fibonacci series.
8 Write a program to solve 4-Queen problem.
9 Write a program to solve traveling salesman problem.
10 Write a program to solve water jug problem using LISP
11 Write a program to implement DFS and BFS
12 Write a Program to find the solution for travelling salesman Problem
13 Write a program to implement Simulated Annealing Algorithm
14 Write a program to find the solution for wampus world problem
15 Write a program to implement 8 puzzle problem
16 Write a program to implement Towers of Hanoi problem
17 Write a program to implement A* Algorithm
18 Write a program to implement Hill Climbing Algorithm

**Subject Name: Object Oriented Programming Lab  Subject Code: BTCCSPCC501  Subject Credit: 2**

**Laboratory Objectives:**

1 To strengthen problem solving ability by using the characteristics of an object-oriented approach.
2 To design applications using object-oriented features
3 To handle Exceptions in programs.
4 To teach the student to implement object-oriented concepts

**Laboratory Outcomes**

The students will be able to:

1 Practice object-oriented programs and build java applications.
2 Implement java programs for establishing interfaces.
3 Implement sample programs for developing reusable software components.
**4** Create database connectivity in java and implement GUI applications.

**Choice of 10-12 experiments from the following:**

**BASIC PROGRAMS**

a. Try debug step by step with small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
b. Write a java program that prints all real solutions to the quadratic equation ax2 +bx+c=0. Read in a, b, c and use the quadratic formula.
c. The Fibonacci sequence is defined by the following rule. The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a java program that uses both recursive and non recursive functions.

**MATRICES, OVERLOADING, OVERRIDING**

a. Write a java program to multiply two given matrices.
b. Write a java program to implement method overloading and constructors overloading.
c. Write a java program to implement method overriding.

**PALINDROME, ABSTRACT CLASS**

a. Write a java program to check whether a given string is palindrome.
b. Write a java program for sorting a given list of names in ascending order.
c. Write a java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape

**INTERFACE**

Write a program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

**MULTITHREADING**

a. Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

b. Write a java program that correct implements of producer consumer program

**FILES**

a. Write a java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.

b. Write a java program that displays the number of characters, lines and words in a text file.

c. Write a java program that reads a file and displays the file on the screen with line number before each line.

d. Suppose that table named table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using labels in grid layout.

e. Write a java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.

**JAVA PROGRAM WITH DATABASE**

a. Write a java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (/t). It takes a name or phone number as input and prints the corresponding other value from the hash table. Hint: Use hash tables.

b. Implement the above program with database instead of a text file.

# 6th Semester

| Subject Name: Compiler Design | Subject Code: BTCCSPCC601 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

- To understand and list the different stages in the process of compilation.
- Identify different methods of lexical analysis
- Design top-down and bottom-up parsers
- Identify synthesized and inherited attributes
- Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine

**Course Outcomes:**

At the end of the course, the students are expected to:

1. For a given grammar specification develop the lexical analyser
2. For a given parser specification design top-down and bottom-up parsers
3. Develop syntax directed translation schemes
4. Develop algorithms to generate code for a target machine.

**Detailed contents**

**Introduction:**
Phases of compilation and overview.

**Lexical Analysis (scanner**):
Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).

**Syntax Analysis (Parser):**
Context-free languages and grammars, push-down automata, LL(1) gram-mars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)

**Semantic Analysis:**
Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree.

**Symbol Table:**
Its structure, symbol attributes and management.

**Run-time environment:**

Procedure activation, parameter passing, value return, memory allocation, and scope.

**Intermediate Code Generation:**

Translation of different language features, different types of intermediate forms.

**Code Improvement (optimization):**

Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc. **Architecture dependent code improvement:**

instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation

**Advanced topics:**

Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

***Text/Reference Books:***


1. Aho, Sethi, Ullman - "Compiler Principles, Techniques and Tools" - Pearson Education.
2. Holub - "Compiler Design in C" – PHI
3.Tremblay and Sorenson Compiler Writing-McgrawHill International .
4. Chattopadhyay , S- Compiler Design ( PHI)


| **Subject Name: Operating System** | **Subject Code: BTCCSPCC602** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

To learn the fundamentals of Operating Systems.

1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management

**Course Outcomes**

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.

5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

**Detailed contents**

**Module 1: Introduction:**

Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

**Module 2:**

**Processes:**

Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

**Thread:**

Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

**Process Scheduling:**

Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

**Module 3:**

**Inter-process Communication:**

Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

**Module 4:**

**Deadlocks:**

Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

**Module 5:**

**Memory Management:**

Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

**Virtual Memory:**

Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

**Module 6:**

**I/O Hardware:**

I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

**File Management:**

Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

**Disk Management:**

Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

***Text/Reference Books:***

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.
3. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
4. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
5. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
6. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

**Subject Name: Computer Network Subject Code: BTCCSPCC603 Subject Credit: 3**

**Course Objectives:**

- To develop an understanding of modern network architectures from a design and performance perspective.
- To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To provide an opportunity to do network programming
- To provide a WLAN measurement ideas.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
4. For a given problem related TCP/IP protocol developed the network programming.
5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

**Detailed contents**

**Module 1:**

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

**Module 2:**

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

**Module 3:**

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

**Module 4:**

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

**Module 5:**

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

***Text/Reference Books:***


1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.


| **Subject Name: Machine Learning** | **Subject Code: BTCCSPCC604** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

The objective of the course is

1. To understand the basic theory underlying machine learning.
2. To be able to formulate machine learning problems corresponding to different applications.
3. To understand a range of machine learning algorithms along with their strengths and weaknesses.
4. To be able to apply machine learning algorithms to solve problems of moderate complexity.
5. To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

**Course Outcomes:**

Students should be able to:

1. Develop an appreciation for what is involved in Learning models from data
2. Understand a wide variety of learning algorithms
3. Understand how to evaluate models generated from data
4. Apply the algorithms to a real problem, optimize the models learned and report on the expected accuracy that can be achieved by applying

the models.

**Detailed contents**

**Module 1:**
Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation
**Module 2:**
Linear regression, Decision trees, overfitting
**Module 3:**
Instance based learning, Feature reduction, Collaborative filtering based recommendation Probability and Bayes learning
**Module 4:**
Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM
**Module 5:**
Neural network: Perceptron, multilayer network, backpropagation, introduction to deep neural network
**Module 6:**
Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning
**Module 7:**
Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

**Text Books:**
1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by EthemAlpaydin
3. Machine Learning and Knowledge Discovery edited by Walter Daelemans, Katharina Morik
4. Pattern Recognition and Machine Learning by Christopher Bishop
5. Introduction to Machine learning with python by Andreas C. Müller and Sarah Guido

| **Subject Name: Data Warehousing** | **Subject Code: BTCCSPEC601** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

- Be introduced to the data warehouse, its advantages and disadvantages.
- Know the concepts, lifecycle and rules of the data warehouse.
- Be informed of the importance and the techniques of data warehouse modeling.
- Recognize the different applications of data warehousing.
- Look forward to the future of the data warehouse.

**Course Outcomes:**

The candidate will get knowledge of

- Data preprocessing and data quality
- Modeling and design of data warehouses.
- Be able to design data warehouses

**Detailed contents**

***Module 1: Introduction to Data Warehousing***
Definition, History, Advantage and Disadvantage, Benefits, Concepts of Data Warehousing

***Module 2: OLTP,OLAP, and other technologies***
Introduction and Objectives, Online transaction processing, Data Store, Data Mart, Design Schemas, Meta Data, Data Webhouse and Data Warehouse, Extract, Transform and load.

***Module 3: Life Cycle and Rules of Data Warehouse***
Data Warehouse lifecycle, Design, Prototype, Deploy, Operate, Enhance, Different loops of data Warehouse Cycle.

***Module 4: Data Warehouse Architecture and Flow***
Data Warehouse Architecture, key components, benefits of architecture, Typical architecture and common architecture. Information flow

***Module 5: Data Warehouse Modeling***
Data Warehouse Modeling Techniques, Entity-Relationship Modeling, limitation of ER, Dimensional Modeling and its benefits,

***Module 6: Data Warehouse Applications***
Retail Industries, Manufacturing and Distributions, Bank, Insurance Companies, Health care providers, Govt Agencies,

Telecommunications, Sports

***Module 7: Challenges and Future of Data Warehouse***
Challenges, Ensuring Data quality, performance, Testing the data warehouse, Reconciliation of data, User Acceptance, Future of data warehouse

***Text/Reference Books:***

1. The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling (Paperback)by Ralph Kimball
2. Building the Data Warehouse (Paperback)by William H. Inmon
3. Data Warehouse Design Solutions (Paperback)by Christopher Adamson

| **Subject Name: Soft Computing** | **Subject Code: BTCCSPEC602** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

- To have an understanding of the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms.
- To provide the mathematical background for carrying out the optimization associated with neural network learning.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Develop intelligent systems leveraging the paradigm of soft computing techniques.
2. Implement, evaluate and compare solutions by various soft computing approaches for finding the optimal solutions.
3. Recognize the feasibility of applying a soft computing methodology for a particular problem.
4. Design the methodology to solve optimization problems using fuzzy logic, genetic algorithms and neural networks.
5. Design hybrid system to revise the principles of soft computing in various applications

**Detailed contents**

**Module-I :Introduction:**
Introduction to soft computing; introduction to fuzzy sets and fuzzy logic systems; introduction to biological and artificial neural network; introduction to Genetic Algorithm.

**Module-II : Fuzzy sets and Fuzzy logic systems:**
Classical Sets and Fuzzy Sets and Fuzzy relations : Operations on Classical sets, properties of classical sets, Fuzzy set operations, properties of fuzzy sets, cardinality, operations, and properties of fuzzy relations.
Membership functions : Features of membership functions, standard forms and boundaries, different fuzzification methods. Fuzzy to Crisp conversions: Lambda Cuts for fuzzy sets, fuzzy Relations, Defuzzification methods.
Classical Logic and Fuzzy Logic: Classical predicate logic, Fuzzy Logic, Approximate reasoning and Fuzzy Implication Fuzzy Rule based Systems: Linguistic Hedges, Fuzzy Rule based system – Aggregation of fuzzy Rules, Fuzzy Inference System-Mamdani Fuzzy Models – Sugeno Fuzzy Models.
Applications of Fuzzy Logic: How Fuzzy Logic is applied in Home Appliances, General Fuzzy Logic controllers, Basic Medical Diagnostic systems and Weather forecasting

**Module-III : Neural Network**
Introduction to Neural Networks:Advent of Modern Neuroscience, Classical AI and Neural Networks, Biological Neurons and Artificial neural network; model of artificial neuron. Learning Methods : Hebbian, competitive, Boltzman etc., Neural Network models: Perceptron, Adaline and Madaline networks; single layer network; Back-propagation and multi layer networks.
Competitive learning networks: Kohonenself organizing networks, Hebbian learning; Hopfield Networks.
Neuo-Fuzzy modelling: Applications of Neural Networks: Pattern Recognition and classification

**Module-IV : Genetic Algorithms:**
Simple GA, crossover and mutation, Multi-objective Genetic Algorithm (MOGA). Applications of Genetic Algorithm: genetic algorithms in search and

optimization, GA based clustering Algorithm, Image processing and pattern Recognition

**Module-V Other Soft Computing techniques:**
Simulated Annealing, Tabu search, Ant colony optimization (ACO), Particle Swarm Optimization (PSO).

***Text/Reference Books:***


1. Fuzzy logic with engineering applications, Timothy J. Ross, John Wiley and Sons.
2. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI
3. Principles of Soft Computing , S N Sivanandam, S. Sumathi, John Wiley & Sons
4. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg
5. Neuro-Fuzzy and Soft computing, Jang, Sun, Mizutani, PHI
6. Neural Networks: A Classroom Approach,1/e by Kumar Satish, TMH,
7. Genetic Algorithms in search, Optimization & Machine Learning by David E. Goldberg, Pearson/PHI
8. A beginners approach to Soft Computing, Samir Roy & Udit Chakraborty, Pearson


| **Subject Name: Sensor Networks** | **Subject Code: BTCCSPEC603** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

- To understand the fundamentals of wireless sensor networks and its application to critical real time scenarios.
- To study the various protocols at various layers and its differences with traditional protocols.
- To understand the issues pertaining to sensor networks and the challenges involved in managing a sensor network.

**Course Outcomes:**

At the end of the course, the students are expected to have

- Technical knowhow in building a sensor network.
- Analysis of various critical parameters in deploying a sensor network.

**Detailed contents**

**Unit I**

Introduction: Fundamentals of wireless communication technology, the electromagnetic spectrum radio propagation, characteristics of wireless channels, modulation techniques, multiple access techniques, wireless LANs, PANs, WANs, and MANs, Wireless Internet.

**Unit II**

Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, driving applications, issues in adhoc wireless networks, issues in design of sensor network, sensor network architecture, data dissemination and gathering.

**Unit III**

MAC Protocols : Issues in designing MAC protocols for adhoc wireless networks, design goals, classification of MAC protocols, MAC protocols for sensor network, location discovery, quality, other issues, S-MAC, IEEE 802.15.4.

**Unit IV**

Routing Protocols: Issues in designing a routing protocol, classification of routing protocols, table-driven, on-demand, hybrid, flooding, hierarchical, and power aware routing protocols.

**Unit V**

QoS and Energy Management : Issues and Challenges in providing QoS, classifications, MAC, network layer solutions, QoS frameworks, need for energy management, classification, battery, transmission power, and system power management schemes.

***Text/Reference Books:***


1. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.
2. Feng Zhao and LeonidesGuibas, "Wireless sensor networks ", Elsevier publication - 2004.
3. Jochen Schiller, "Mobile Communications", Pearson Education, 2nd Edition, 2003.
4. William Stallings, "Wireless Communications and Networks ", Pearson Education - 2004


**Subject Name: Industrial Management and Environmental Control Subject Code: BTCCSOEC601 Subject Credit: 3**

**Course Objectives:**

**Course Outcomes:**

**Detailed contents:**

***Text/Reference Books:***

**Subject Name:Human Resource Development and Organization Behavior Subject Code: BTCCSOEC602 SubjetCredit:3**

**Course Objectives:**

The course shall be conducted in an interactive manner since students learn best by active participation. Lecture and discussion method will be followed to familiarize students with the theories, concepts, techniques, etc. The instructor would also employ tools like case discussions, exercises, games, psychometric testing, etc. to aid students' understanding of theoretical concepts. Collaborative learning would be emphasized in the form of group exercises, group projects, role plays, etc. Thrust would be given to analysis and application of each topic from the perspective of development organizations. Students will require attending classes with in-advance readings of the topic(s) with reading material available in text/reference books and library resource centre as per the course outline.

**Course Outcomes:**

Upon successful completion of this course, the students will be able to

- Develop basic understanding of organizational behavior
- Apply different dimensions of organizational behavior in organizational system and procedures
- Understand the importance and basic concepts of human resource management
- Know the functions of human resource management and their importance for organizational effectiveness

**Detailed contents**

**Module I**

What is Organizational Behaviour (OB) and Human Resource Management (HRM) Difference between corporates and development organizations OB and HRM and Sustainable development OB and HRM: contribution and linkages with sustainability Importance of OB and HRM for sustainable development practitioners

**Module II**

Knowing and Managing Yourself Individual Behaviour: MARS model of individual behaviour Values: Values across cultures (Hofstede's framework); Personality: Big five model; MBTI; Use of personality tests; Personality attributes influencing OB Emotions: Understanding emotions; Emotional labour; Emotional Intelligence Attitudes: Attitudes v/s values; Job Satisfaction; Organizational Commitment Perception: Factors influencing perception; Perceptual errors; Self-fulfilling prophecy; Know yourself: Johari window

**Module III**

Motivation in the workplace What is motivation; Early theories of motivation; Contemporary theories of motivation; Designing motivating jobs: JCM model; motivation of social workers.

**Module IV**

Work Teams Teams v/s groups; Why teams; A model of Team effectiveness: Context, Composition, Work design, Process; Virtual teams; Turning individuals into team players

**Module V**

Communication What is communication; Organizational communication: Formal networks and Grapevine; Electronic communications; Barriers to effective communication; non- verbal communication; Improving Interpersonal communication: Empathy and Active listening

**Module VI**

Leadership Difference between managers and leaders; Perspectives of leadership: Trait, Behavioral, Contingency; Inspirational leadership: Transactional, Transformational, Charismatic; NGO leadership

**Module VII**

Job Analysis Job description; Job Specification; Job Evaluation

**Module VIII**

Recruitment, Selection, Orientation Sources of recruitment: Internal and external; Steps in selection process; Socialization and Induction; NGO recruitment

**Module IX**

Performance Management What is performance appraisal; Purposes, Process and Uses; Methods of Performance Appraisal: Traditional and Modern; problems in Performance Appraisal; Designing effective performance appraisal systems

**Module X**

Compensation Management What is compensation; Objectives and factors determining compensation; Methods of Job Evaluation; Developing pay structures, Executive remuneration; components of compensation; Incentives

***Text/Reference Books:***


1. McShane, S.L. and Von Glinow, M.A., Organizational Behaviour, New Delhi, Tata McGrawHill Publishing company ltd.
2. P. Jyothi, P. and Venkatesh, D.N., Human Resource Management, New Delhi, Oxford University Press.
3. Denhardt, R.B., Denhardt, J.V., and Aristigueta, M.P. (2009), Managing Human Behaviour in Public and Non-Profit Organizations, Second edition. California, Sage Publications.
4. Pynes, J.E. (2004). Human Resources Management for Public and Nonprofit Organizations, Second Edition. San Francisco, CA: Jossey- Bass Publishers.
5. Drucker, Peter F. Managing the Non-profit Organization: Principles and Practices. Harper Business, 1990.


**Subject Name: Cyber Law and Cyber Security  Subject Code: BTCCSOEC603  Subject Credit: 3**

**Course Objectives:**

The objectives of this course is to enable learner to understand, explore, and acquire a critical understanding cyber law. Develop competencies for dealing with frauds and deceptions (confidence tricks, scams) and other cybercrimes for example, child pornography etc. That are taking place via the internet.

**Course Outcomes:**

1. Make learner conversant with the social and intellectual property issues emerging from ‘cyberspace.

2. Explore the legal and policy developments in various countries to regulate cyberspace;

3. Develop the understanding of relationship between commerce and cyberspace;

4. Give learners in depth knowledge of information technology act and legal frame work of right to privacy, data security and data protection.

5. Make study on various case studies on real time crimes.

**Detailed contents**

***Module 1: Introduction to Cyber Law Evolution of Computer Technology***

Emergence of Cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Web space, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.

***Module 2: Information technology Act***

Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication.

***Module 3: Cyber law and related Legislation***

Patent Law, Trademark Law, Copyright, Software – Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution , Online Dispute Resolution (ODR).

***Module 4: Electronic Business and legal issues***

Evolution and development in Ecommerce, paper vs paper less contracts E-Commerce models- B2B, B2C,E security.

***Application area***

Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.

***Module 5: Case Study On Cyber Crimes***

Harassment Via E-Mails, Email Spoofing (Online A Method Of Sending E-Mail Using A False Name Or E-Mail Address To Make It

Appear That The E-Mail Comes From Somebody Other Than The True Sender, Cyber Pornography (Exm.MMS),Cyber-Stalking.

***Text/Reference Books:***


1. K.Kumar," Cyber Laws: Intellectual property & E Commerce, Security",1 st Edition, Dominant Publisher,2011.
2. Rodney D. Ryder, " Guide To Cyber Laws", Second Edition, Wadhwa And Company, New Delhi, 2007.
3. Information Security policy &implementation Issues, NIIT, PHI
4. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2 nd Edition,PHI,2003.
5. Justice Yatindra Singh, " Cyber Laws", Universal Law Publishing, 1 stEdition,New Delhi, 2003.
6. Sharma, S.R., "Dimensions Of Cyber Crime", Annual Publications Pvt. Ltd., 1st Edition, 2004.
7. Augastine, Paul T.," Cyber Crimes And Legal Issues", Crecent Publishing Corporation, 2007.


## Subject Name: Internship in Industry/Research/Academic Institute Subject Code: BTCCSPPC601 SubjeCredit: 0

**Course Objectives:**

**Course Outcomes:**

**Detailed contents:**

***Text/Reference Books:***

## Subject Name: Indian Constitution Subject Code: BTCCSMC601 Subject Credit: 2

**Course Objectives:**

Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective and to address the growth of Indian opinion regarding modern Indian intellectuals_ constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

**Course Outcomes:**

On completion of this course, the students will be able to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

**Detailed contents:**

**Unit-1**

**History of Making of the Indian Constitution History of Making of the Indian Constitution:**

History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features, Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

**Unit – 2**

**Organs of Governance Organs of Governance:**

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications. Powers and Functions

**Unit – 3 Local Administration Local Administration:**

District_s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

**Unit – 4**

**Election Commission Election Commission:**

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women

***Text/Reference Books:***


1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014

| Subject Name: Operating System Lab | Subject Code: BTCCSPEC602 | Subject Credit: 1 |
|---|---|---|

**Laboratory Objectives:**

1. familiarize the students with the Operating System.
2. To demonstrate the process, memory, file and directory management issues under the UNIX/ LINUX Operating system
3. To introduce LINUX basic commands
4. To make students how to make simple programs in LINUX and administrative task of LINUX

**Laboratory Outcomes**

1. Describe OS support for processes and threads
2. Recognize CPU Scheduling, synchronization, and deadlock.
3. Use C / C++ and Unix commands, and develop various system programs under Linux to make use of OS concepts related to process synchronization, shared memory, file systems, etc.

**List of experiments from the following:**

1. Basic LINUX commands and its Use.
2. Study of editors in LINUX
3. Detail study of File Access Permission in LINUX.
4. Detail study of LINUX Shell Programming.
5. Advance Shell Programming.
6. Programs on UNIX System calls.
7. Programs on process creation and synchronization, inter process communication including shared memory, pipes and messages. (Dinning Philosopher problem / Cigarette Smoker problem / Sleeping barber problem).
8. Simulation of CPU Scheduling Algorithms. (FCFS, RR, SJF, Priority, Multilevel Queuing).
9. Simulation of Banker's Algorithm for Deadlock Avoidance.
10. Program for FIFO, LRU, and OPTIMAL page replacement algorithm.

# 7th Semester

| Subject Name: Big Data Analysis | Subject Code: BTCCSPCC701 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

The objective of the course is to

1. Provide an overview of Apache Hadoop
2. Provide HDFS Concepts and Interfacing with HDFS
3. Understand Map Reduce Jobs
4. Provide hands on Hodoop Eco System
5. Apply analytics on Structured, Unstructured Data. Exposure to Data Analytics

**Course Outcomes:**

At the end of the course, the students are expected to:
1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
2. To study the basic technologies that forms the foundations of Big Data.
3. To study the programming aspects of cloud computing with a view to rapid prototyping of complex applications.
4. To understand the specialized aspects of big data including big data application, and big data analytics.
5. To study different types Case studies on the current research and applications of the Hadoop and big data in industry

**Detailed contents**

**Module 1:** INTRODUCTION
What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics
**Module 2:**NoSQL
Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing mapreduce calculations.
**Module 3:** Hadoop
Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

**Module 4:** MapReduce
MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.
**Module 5:** Big data Analysis
Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.
**Text Books:**
1. Handbook of big data technology by Zomaya and Sakr.
2. Real time Big Data Analytics Book by Sumit Gupta
3. Tom White "Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
4. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.
5. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Raj kamal, Preeti Saxena, McGraw Hill, 2018.
6. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and
Ambiga Dhiraj, John Wiley & Sons, 2013

| **Subject Name: Internet of Things** | **Subject Code: BTCCSPCC702** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IOT Devices.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Understand the definition and significance of the Internet of Things
2. Discuss the architecture, operation, and business benefits of an IoT solution
3. Examine the potential business opportunities that IoT can uncover
4. Explore the relationship between IoT, cloud computing, and big data
5. Identify how IoT differs from traditional data collection systems

**Detailed contents**

Internet in general and Internet of Things: layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia. Transport services: TCP, UDP, socket programming. Network layer: forwarding & routing algorithms (Link, DV), IP-addresses, DNS, NAT, and routers. Local Area Networks, MAC level, link protocols such as: point-to-point protocols, Ethernet, WiFi 802.11, cellular Internet access, and Machine-to-machine. Mobile Networking: roaming and handoffs, mobile IP, and ad hoc and infrastructure less networks. Real-time networking: soft and real time, quality of service/information, resource reservation and scheduling, and performance measurements. IoT definitions: overview, applications, potential & challenges, and architecture.

**text/Reference Books:**

**1**. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, ―From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence‖, 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and ArshdeepBahga, ―Internet of Things (A Hands-on-Approach)‖, 1stEdition, VPT, 2014.
3. Rajkumar Buyaa and Amir V Dastjerdi, *Internet of things: Principles and Paradigms*, Morgan Kaufmann
4. A Bahga& V Madisetti, *Internet of Things: A Hands On Approach*, Universities Press

## Subject Name: Neural Network and Deep Learning Subject Code: BTCCSPEC701 Subject Credit: 3

**Course Objectives:**

Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

**Course Outcomes:**

At the end of the course, the students are expected to:

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

**Detailed contents**

***Module 1: Introduction***

Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

***Module 2: Feed forward neural network***

Artificial Neural Network, activation function, multi-layer neural network.

***Module 3: Training Neural Network***

Risk minimization, loss function, back propagation, regularization, model selection, and optimization.

***Module 4: Conditional Random Field***

Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

***Module 5: Deep Learning***

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.

***Module 6: Probabilistic Neural Network***

Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Auto encoders.

***Module 7: Deep Learning research***

Object recognition, sparse coding, computer vision, natural language processing.

***Module 8: Deep Learning Tools***

Caffe, Theano, Torch.

***Text/Reference Books:***


1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006
3. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
4. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
5. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

| Subject Name: E-Commerce and ERP | Subject Code: BTCCSPEC702 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

1. Define E-Marketplaces and list their components.
2. List the Major types of Electronic Markets and describe their features.
3. Describe the types of Intermediaries in EC and their roles.
4. Describe electronic Catalogs, Shopping carts, and search Engines.
5. Describe the various types of Auctions and list their characteristics.

**Course Outcomes:**

After completion of this course, students will be able to

1. Understand the basic concepts and technologies used in the field of management information systems.
2. Understand the processes of developing and implementing information Systems.
3. Be aware of the ethical, social, and security issues of information systems.
4. Understand the role of information systems in organizations, the strategic management processes, and the implications for the management.
5. Develop an understanding of how various information systems work together to accomplish the information objectives of an organization.

**Detailed contents**

***Module 1: Introduction to E-Business and E-Commerce***

Define the e-Commerce and e-Business, Define e-Commerce Types of EC transactions. Define e-Business Models. Internet Marketing and e-Tailing. Elements of e-Business Models. Explain the benefits and limitations of e-Commerce.

***Module 2: E-Marketplaces: Structures, Mechanisms, Economics, & impacts***

Define e-Marketplace and Describe their Functions. Explain e-Marketplace types and their features. Describe the various types of auctions and list their characteristics. Discuss the benefits, limitations and impacts of auctions. E-Commerce in the wireless environment. Competition in the DE and impact on industry.

***Module 3: E-Business applications, E-Procurement and E- Payment Systems***

Integration and e-Business suits. ERP, e-SCM, CRM, E-Payment. E-Procurement definition, processes, methods and benefits. Discuss the categories and users of smart cards. Describe payment methods in B2B EC.

***Module 4: The Impact of E-Business on Different Fields and Industries***

E-Tourism · Employment and Job Market Online Online Real Estate. Online Publishing and e-Books. Banking and Personal Finance Online. On-Demand Delivery Systems and E-Grocers. Online Delivery of Digital Products.

***Module 5: E-Learning and Online Education***

Define electronic learning. Discuss the benefits and drawbacks of e-Learning. The e-Learning Industry. Discuss e-Content development and tools. Describe the major technologies used in e-Learning. Discuss the different approaches for e-Learning delivery. How e-Learning can be evaluated.

***Module 6: E-Government***

Definition of e-Governments · Implementation. E-Government Services. Challenges and Opportunities. E-Government Benefits, Case Study

***Module 7: Launching Online Business and E-Commerce Projects***

Understand the requirements for starting an online business from different perspectives. Describe the funding options available to startup businesses. Understand the processes associated with managing Web site development. Know the techniques of search engine optimization. Evaluate Web sites on design criteria.

***Text/Reference Books:***

1. Electronic Commerce: A Managerial Perspective, Turban, E. et al., Prentice Hall-2008.
2. Frontiers of e-commerce, Ravi Kalakota, Pearson.
3. Electronic Business and Electronic Commerce Management, 2nd edition, Dave Chaffey, Prentice Hall, 2006
4. e-Learning Tools and Technologies, Horton and Horton, Wiley Publishing.

| **Subject Name: Image Processing** | **Subject Code: BTCCSPEC703** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

1. Learn different techniques employed for the enhancement of images.
2. Learn different causes for image degradation and overview of image restoration techniques.
3. learn different feature extraction techniques for image analysis and recognition

**Course Outcomes:**

On completion of this course, the students will be able to

1. To study the image fundamentals and mathematical transforms necessary for image processing.
2. To study the image enhancement techniques
3. To study image restoration procedures.
4. To study the image compression procedures

**Detailed contents:**

**Unit-1**

**Introduction to Digital Image Introduction and Digital Image Fundamentals:**

The origins of Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, DistanceMeasures between pixels, Linear and Non Linear Operations. Image Enhancement: Point Operations, Histograms, Spatial Domain methods, Frequency domain methods.

**Unit – 2**

**Image Restoration & . Image Compression**

Image Restoration Degradation Model, Algebraic approach to Restoration, Inverse Filtering, Wiener Filter, Constrained least square restoration, Interactive restoration, Restoration in spatial domain. Image Compression: Coding, Interpixel and Psychovisual Redundancy, Image Compression Models, Elements of Information Theory, Error free comparison Lossy Compression, Image Compression Standards.

**Unit – 3**

**Image Segmentation Image Segmentation:**

Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation, Motion based segmentation. Representation and Description: Representation, Boundary Descriptors, Regional Descriptors, Use of Principal Components for Description, Introduction to Morphology, Some basic Morphological Algorithms

**Unit – 4**

**Object Recognition Object Recognition:**

Patterns and Pattern Classes, Decision–Theoretic Methods, Structural Methods.

***Text/Reference Books:***

1. Rafael C. Gonzalez & Richard E. Woods, ―Digital Image Processing‖, 2nd Edition
2. A.K. Jain, ―Fundamental of Digital Image Processing‖, PHI

| Subject Name: Business Analytics | Subject Code: BTCCSOEC701 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

1. Introduce the Business intelligence concepts, techniques and models
2. Understand the modeling process behind business analytics
3. To analyze different data analysis tools and techniques

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Understand the fundamental of Business Intelligence and to design a customized solution.
2. Familiarize on the concepts, techniques and reporting methods of descriptive analytics and predictive analytics
3. Explore the methods used to analyze speech and text and implement optimized search engines
4. Design and implement Decision Support systems
5. Familiarize on the processes needed to develop, report, and analyze business data

**Detailed contents**

***Module 1: Introduction to Business Intelligence***

Introduction to Business Intelligence – Designing Business Intelligence Application Requirements Gathering, Establishing the Technical Architecture, Designing a Business Intelligence Solution, Designing Dimensional Models, Designing the Physical Databases

***Module 2: Descriptive Analytics***

Data Warehousing- Definitions and Concepts -- Data Warehousing Architectures - Data Integration and the Extraction, Transformation, and Load (ETL) Processes - Transaction processing- Data Warehouse Development Approaches - Data Warehousing Implementation Issues - Data Warehouse Administration, Security Issues, and Future Trends- Business Reporting, Visual Analytics, and Business Performance Management

***Module 3: Predictive Analytics***

Data Mining Concepts- Definitions, Characteristics, and Benefits - How Data Mining Works - Data Mining Versus Statistics Data Mining

Process - Data Mining Methods - Data Mining and Privacy Issues - Regression – Classification –Association Rules – clustering -Techniques for Predictive Modeling – ANN- SVM

***Module 4: Text Analytics, Text Mining, And Sentiment Analysis***

Text Analytics, Text Mining, and Sentiment Analysis - Natural Language Processing - Text Mining Process- tools - Sentiment Analysis - Overview, Process, Applications - Speech Analytics – Rule based, Multi, Layer, Hybrid Sentimental analysis – Machine Learning in Sentimental analysis

***Module 5: Web Analytics and Web***

Web Mining Overview - Web Content and Web Structure Mining - Search Engines - Search Engine Optimization - Web Analytics Technologies, metrics - Web Analytics Maturity Model and Web Analytics Tools

***Module 6: Prescriptive Analytics***

Decision Support Systems Modeling - Mathematical Models for Decision Support - Certainty, Uncertainty, and Risk- Decision Modeling with Spreadsheets - Mathematical Programming Optimization - Decision Analysis with Decision Tables and Decision Trees - Problem-Solving Search Methods - Problem-Solving Search Methods

***Module 7: Knowledge Management and Big Data Analytics***

Knowledge Management –Concepts, Definitions, Approaches, tools and techniques - Big Data and Analytics- Fundamentals of Big Data Analytics – Technologies - Data Scientist - Big Data and Data Warehousing - Automated Decision Systems and Expert Systems - Business Analytics: Emerging Trends and Future Impacts

***Module 8: Recent Trends***

**Text/Reference Books:**


1. Efraim Turban, Ramesh Sharda, DursunDelen, “Business Intelligence and Analytics”, 10th Edition, Pearson , 2015.
2. S. Christian Albright, Wayne L. Winston, Business Analytics: Data Analysis & Decision Making, 6th Edition, CENGAGE INDIA , 2017
3. Dinabandhu Bag, Business Analytics, Routledge, 1st edition, 2016
4. Rick Sherman, Business Intelligence Guidebook: From Data Integration to Analytics, Morgan Kaufmann, 1st editio

| Subject Name: Human Computer Interaction | Subject Code: BTCCSOEC702 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Explain the capabilities of both humans and computers from the viewpoint of human information processing.
2. Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
3. Apply an interactive design process and universal design principles to designing HCI systems.
4. Describe and use HCI design principles, standards and guidelines.
5. Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
6. Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design.

**Detailed contents**

***Module 1: Introduction***

Usability of Interactive Systems- introduction, usability goals and measures, usability motivations, universal usability, goals for our profession Managing Design Processes: Introduction, Organizational design to support usability, Four pillars of design, development methodologies, Ethnographic observation, Participatory design, Scenario Development, Social impact statement for early design review, legal issues, Usability Testing and Laboratories

***Module 2: Menu Selection, Form Fill-In and Dialog Boxes***

Introduction, Task- Related Menu Organization, Single menus, Combinations of Multiple Menus, Content Organization, Fast Movement Through Menus, Data entry with Menus: Form Fill-in, dialog Boxes, and alternatives, Audio Menus and menus for Small Displays

***Module 3: Command and Natural Languages***

Introduction, Command organization Functionality, Strategies and Structure, Naming and Abbreviations, Natural Language in Computing Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory Interfaces, Displays- Small and large.

***Module 4: Quality of Service***

Introduction, Models of Response-Time impacts, Expectations and attitudes, User Productivity, Variability in Response Time, Frustrating Experiences Balancing Function and Fashion: Introduction, Error Messages, Nonanthropomorphic Design, Display Design, Web Page Design, Window Design, Color

***Module 5: User Documentation and Online Help***

Introduction, Online Vs Paper Documentation, Reading from paper Vs from Displays, Shaping the content of the Documentation, Accessing the Documentation, Online tutorials and animated documentation, Online communities for User Assistance, The Development Process

***Module 6: Information Search***

Introduction, Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Searching Interfaces Information Visualization: Introduction, Data Type by Task Taxonomy, Challenges for Information Visualization

**Text/Reference Books:**


1. Human Computer, Interaction Dan R.Olsan, Cengage ,2010.
2. Designing the user interface. 4/e, Ben Shneidermann , PEA.
3. User Interface Design, Soren Lauesen , PEA.
4. Interaction Design PRECE, ROGERS, SHARPS, Wiley.


**Subject Name: Cryptography and Network Security Subject Code: BTCCSOEC703 Subject Credit: 3**

**Course Objectives:**

1. Explain the objectives of information security
2. Explain the importance and application of each of confidentiality, integrity, authentication and availability
3. Understand various cryptographic algorithms.
4. Understand the basic categories of threats to computers and networks
5. Describe public-key cryptosystem.
6. Describe the enhancements made to IPv4 by IPSec
7. Understand Intrusions and intrusion detection
8. Discuss the fundamental ideas of public-key cryptography.
9. Generate and distribute a PGP key pair and use the PGP package to send an encrypted e-mail message.
10. Discuss Web security and Firewalls

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Student will be able to understand basic cryptographic a algorithms, message and web authentication and security issues.
2. Ability to identify information system requirements for both of them such as client and server.
3. Ability to understand the current legal issues towards information security.

**Detailed contents**

***Module 1:***

**Attacks on Computers and Computer Security**
Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security

**Cryptography: Concepts and Techniques**
Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

***Module 2:***

**Symmetric key Ciphers**
Block Cipher principles &Algorithms(DES, AES, Blowfish), Differential and Linear Crypt analysis, Block cipher modes of operation, Stream ciphers, RC4,Location and placement of encryption function, Key distribution
**Asymmetric key Ciphers**
Principles of public key cryp to systems, Algorithms(RSA, Diffie-Hellman, ECC), Key Distribution.

***Module 3:***

**Message Authentication Algorithms and Hash Functions**
Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm
**Authentication Applications**
Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication.

***Module 4:***

**E-Mail Security**
Pretty Good Privacy, S/MIME

**IP Security**
IP security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, key management.

***Module 5:***

**Web Security**
Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction
**Intruders, virus and Firewalls**
Intruders, Intrusion detection, password management, virus and related threats, Countermeasures, Firewall design principles, types of firewalls
**Case Studies on Cryptography and security**
Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual E lections

**Text/Reference Books:**


1. Cryptography and Network Security : William Stallings, Pearson Education,4″‘ Edition
2. Cryptography and Network Security : Atul Kahate, Mc Graw Hill Edition
3. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, **1”**
4. Cryptography and Network Security :Forouzan Mukhopadhyay, MC Graw Hill, 2″” Edition
5. Information Security, Principles and Practice: Mark Stamp, Wiley India.
6. Principles of Computer Security: WM.Arthur Conklin, Greg White, TMH
7. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
8. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning


| **Subject Name: Block Chain Technology** | **Subject Code: BTCCSPEC602** | **Subject Credit: 3** |
|---|---|---|

**Course Objectives:**

This course is intended to study the basics of Blockchain technology. During this course learner will explore various aspects of Blockchain technology like application in various domains. By implementing learner will have idea about private and public Blockchain, and smart contract.

**Course Outcomes:**

After the completion of this course, student will be able to

1. Understand and explore the working of Blockchain technology (Understanding)
2. Analyze the working of Smart Contracts (Analyze)
3. Understand and analyze the working of Hyperledger (Analyze).
4. Apply the learning of solidity and de-centralized apps on Ethereum (Apply).

**Detailed contents**

***Module 1: Introduction of Cryptography and Blockchain***

What is Blockchain, Blockchain Technology Mechanisms & Networks, Blockchain Origins, Objective of Blockchain, Blockchain Challenges, Transactions And Blocks, P2P Systems, Keys As Identity, Digital Signatures, Hashing, and public key cryptosystems, private vs. public Blockchain.

***Module 2: BitCoin and Cryptocurrency***

What is Bitcoin, The Bitcoin Network, The Bitcoin Mining Process, Mining Developments, Bitcoin Wallets, Decentralization and Hard Forks, Ethereum Virtual Machine (EVM), Merkle Tree, Double-Spend Problem, Blockchain And Digital Currency, Transactional Blocks, Impact Of Blockchain Technology On Cryptocurrency.

***Module 3: Introduction to Ethereum***

What is Ethereum, Introduction to Ethereum, Consensus Mechanisms, How Smart Contracts Work, Metamask Setup, Ethereum Accounts, Receiving Ether's What's a Transaction?, Smart Contracts.

***Module 4: Introduction to Hyperledger***

What is Hyperledger? Distributed Ledger Technology & its Challenges, Hyperledger & Distributed Ledger Technology, Hyperledger Fabric, Hyperledger Composer.

***Module 5: Solidity Programming***

Solidity - Language of Smart Contracts, Installing Solidity & Ethereum Wallet, Basics of Solidity, Layout of a Solidity Source File & Structure of Smart Contracts, General Value Types (Int, Real, String, Bytes, Arrays, Mapping, Enum, address).

***Module 5: Blockchain Applications***

Internet of Things, Medical Record Management System, Domain Name Service and Future of Blockchain, Alt Coins.

***Text/Reference Books:***


1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Antonopoulos, Mastering Bitcoin.
3. Antonopoulos and G. Wood, Mastering Ethereum.
4. D. Drescher, Blockchain Basics. Apress, 2017.


**Subject Name: Natural Language Processing Subject Code: BTCCSPEC602 Subject Credit: 3**

**Course Objectives:**

The basic objectives of natural language processing course are the following:

1. Learn the basics of natural language processing and understand various steps in it.
2. To introduce the fundamentals of language processing from the algorithmic viewpoint.
3. To discuss various issues that make natural language processing a hard task.
4. To discuss some well-known applications of natural language processing

**Course Outcomes:**

At the end of the course, the student should be able to:

1. Appreciate the fundamental concepts of natural language processing.
2. Design algorithms for natural language processing tasks.
3. Develop useful systems for language processing and related tasks involving text processing

**Detailed contents**

***Module 1: Introduction***

Natural Language Processing tasks in syntax, semantics, and pragmatics – Issues – Applications – The role of machine learning – Probability Basics –Information theory – Collocations -N-gram Language Models – Estimating parameters and smoothing – Evaluating language models.

**Module 2:Word Level and Syntactic Analysis**

Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Contextfree Grammar-Constituency- Parsing-Probabilistic Parsing.

**Module 3:Semantic Analysis and Discourse Processing**

Semantic Analysis: Meaning Representation-Lexical Semantics- Ambiguity-Word Sense Disambiguation. Discourse Processing: cohesion-Reference Resolution- Discourse Coherence and Structure.

***Module 4:*Natural Language Generation and Machine Translation**

Natural Language Generation: Architecture of NLG Systems- Generation Tasks and RepresentationsApplication of NLG. Machine Translation: Problems in Machine Translation- Characteristics of Indian Languages- Machine Translation Approaches-Translation involving Indian Languages.

***Module 5: Information Retrieval and Lexical Resources***

Information Retrieval: Design features of Information Retrieval Systems-Classical, Non-classical, Alternative Models of Information Retrieval – valuation Lexical Resources: WorldNet-Frame NetStemmers-POS Tagger- Research Corpora.

**Text/Reference Books:**

1. Daniel Jurafsky , James H. Martin , "Speech & language processing", Pearson publications.
2. Allen, James. Natural language understanding. Pearson, 1995

**Subject Name: Optimization Technique Subject Code: BTCCSPEC602 Subject Credit: 3**

**Course Objectives:**

Introduction to optimization techniques using both linear and non-linear programming. The focus of the course is on convex optimization though some techniques will be covered for non-convex function optimization too. After an adequate introduction to linear algebra and probability theory, students will learn to frame engineering minima maxima problems in the framework of optimization problems.

**Course Outcomes:**

By the end of the course, students should be able to:

1. Cast engineering minima/maxima problems into optimization framework.
2. Learn efficient computational procedures to solve optimization problems.
3. Use Matlab to implement important optimization methods.

**Detailed contents**

***Module 1: Mathematical preliminaries***

Linear algebra and matrices, Vector space, eigen analysis, Elements of probability theory, Elementary multivariable calculus

***Module 2: Linear Programming***

Introduction to linear programming model, Simplex method, Duality,Karmarkar's method

***Module 3: Unconstrained optimization***
One-dimensional search methods, Gradient-based methods, Conjugate direction and quasi-Newton methods

***Module 4: Constrained Optimization***
Lagrange theorem, FONC, SONC, and SOSC conditions

***Module 5: Non-linear problems***

Non-linear constrained optimization models, KKT conditions, Projection methods

***Text/Reference Books:***

1. An introduction to Optimization by Edwin P K Chong, Stainslaw Zak

2. Nonlinear Programming by Dimitri Bertsekas

| Subject Name: Web Mining | Subject Code: BTCCSPEC602 | Subject Credit: 3 |
|---|---|---|

**Course Objectives:**

Student will study how to search and gather the data in the web and process as well as mine that data to extract meaningful information to understand its application to search engines. Students will gain an understanding of the strategic and operational aspects of Web analytics. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs. Students will also understand the basic concepts behind information retrieval and data mining.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Understand the concepts of web, web mining, web intelligence and analytics. (Understand)
2. Learn and implement Web Mining using web intelligent algorithms. (Apply)
3. Learn and apply how to retrieve information from web. (Apply)
4. Learn how to use and deploy web/social analytics platforms such as Google Analytics. (Apply)

**Detailed contents**

***Module 1: Introduction to Web:***
Introduction to Internet, web, blogs, tweets, wikis, grid, and cloud. Collaborative mapping, Components of typical web, Characteristics and benefits of the Web.

***Module 2: Web Intelligence:***
Semantic web, Social intelligence, Search engine techniques, Web information retrieval and filtering, Levels of WI, Goal of WI, Characteristics of web intelligence, Challenges and issues of WI, Future of WI.

***Module 3: Web Information Retrieval:***
Managing web data. Web search engines, Google searching, Introduction to web crawler, Architecture of a web crawler, Distributed crawling, Focused spiders/crawlers, Collaborative crawling, Some tools and open source for web crawling, Models of information retrieval.

***Module 4: Web mining:***
Introduction to data mining: Classification & clustering, Pattern recognition, Introduction to web mining, Evolution, Process, Web content mining, Web usage mining, Web structure mining.

***Module 5: Intelligent Web Algorithms:***
The intelligent-algorithm lifecycle, Classes of intelligent algorithm, Recommendation engines based on users, items, and content.

***Module 6: Web Analytics:***
How Web Analytics Works – Basic Concepts, collection of Web Data and other types of data, basic dashboards, Predictive Analytics, Web Analytics Ecosystem and Tools, Data Visualization, Acquisition and Conversions.

**Text/Reference Books:**


1. Intelligent Technologies for Web Applications - Priti Srinivas Sajja, Rajendra Akerkar, CRC Press - Taylor & Francis Group.
2. Algorithms of the Intelligent Web, Second Edition - Douglas G. McIlwraith, HaralambosMarmanis, and Dmitry Babenko, Manning Publications.
3. Mining the Social Web, Third Edition, Matthew A. Russell and Mikhail Klassen, Published by O'Reilly Media.
4. Data Mining Practical Machine Learning Tools and Techniques, Fourth Edition, Ian Witten, Eibe Frank, Mark Hall, Christopher Pal, Elsevier.


**Subject Name: Game Theory Subject Code: BTCCSPEC602 Subject Credit: 3**

**Course Objectives:**

The aim of this course is to introduce students to the novel concepts of game theory including cooperative games, non-cooperative games and mechanism design concepts. The course will also give a special emphasis on its applications in current day computer engineering domains including cloud computing systems, social media analytics, security mechanisms, Internet marketing strategies, wireless networks, communication systems, cyber physical systems etc. Students should also be able to model and solve problems in interdisciplinary domains. After this course the students should be able to model several real situations using game-theory and design solutions (mechanisms, algorithms, protocols etc.) that are robust even in presence of "self-centered" entities.

**Course Outcomes:**

At the end of the course, the students are expected to:

1. Understand various types of non-cooperative game theory concepts.

2. Understand various types of cooperative game theory concepts.
3. Understand various mechanism design concepts including auctions.
4. Design robust and efficient solutions (mechanisms, algorithms, protocols) that would work for agents that are rational and intelligent in interdisciplinary domains.
5. Model real-world situations such as social media marketing, social analytics, cloud computing issues, wireless networks etc. using game theory.

**Detailed contents**

***Module 1:***

Introduction to Game Theory, Current trends and modern applications, Non-Cooperative Games – Strategic form, Preferences, Utilities, Extensive Form Games, Strategic Form Games - Matching Pennies, Prisoners Dilemma, Coordination Game, Dominant Strategy Equilibria, Pure Strategy Nash Equilibria, Mixed strategies, Nixed strategy Nash Equilibria, Matrix Games

***Module 2:***

Cooperative Games - Correlated Equilibrium, Bargaining Games, Nash Bargaining Solution, Coalitional Games, Core of Coalitional Games, Shapely Value, Stable Matching – Matching problem, Evolutionary Games – Evolutionary stable strategy.

***Module 3:***

Bayesian Games, Bayesian Nash Equilibria, Mechanism Design – Introduction, Examples, implementation of Social Choice functions by Mechanisms, Incentive Compatibility and Revelation theorem, VCG Mechanisms, Auctions, Mechanism design for Sponsored search auction

**Text/Reference Books:**


1. Y. Narahari. Game Theory and Mechanism Design. IISc Press and the World Scientific Publishing Company, March 2014. (532 pages).
2. Roger B. Myerson. Game Theory: Analysis of Conflict. Harvard University Press, Cambridge, Massachusetts, USA, 1997.
3. Martin J. Osborne. An Introduction to Game Theory. The MIT Press, 2003
4. Michael Maschler, Eilon Solan, and Shmuel Zamir. Game Theory. Cambridge University Press, 2013
5. Philip D. Straffin Jr. Game Theory and Strategy. The Mathematical Association of America, 1993.

**Subject Name: Economics Policies In India** **Subject Code: BTCCSPEC602** **Subject Credit: 3**

**Course Objectives:**

**Course Outcomes:**

**Detailed contents:**

**Text/Reference Books:**

**Subject Name: Soft Skill Development** **Subject Code: BTCCSPEC602** **Subject Credit: 1**

**Course Objectives:**

**Course Outcomes:**

**Detailed contents:**

**Text/Reference Books**

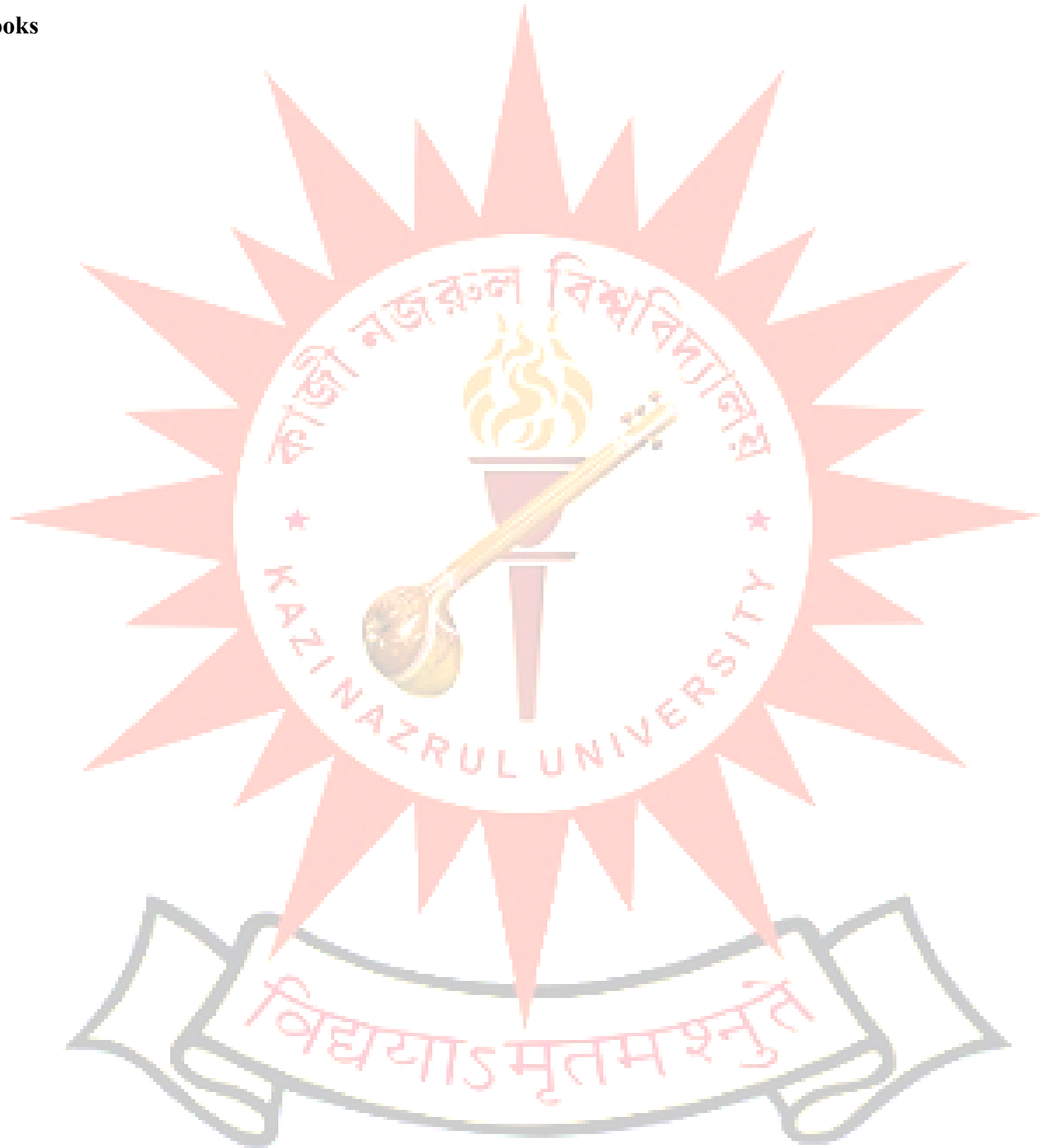
**Subject Name: Project Preliminary** **Subject Code: BTCCSPEC602** **Subject Credit: 1**

**Course Objectives:**

**Course Outcomes:**

**Detailed contents:**

**Text/Reference Books**



# 8th Semester

**Subject Name: Web and Internet Technology  Subject Code: BTCCSPCC801  Subject Credit:3**

**Course Objectives:**

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

**Course Outcomes:**

The student will be able to:

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Style Sheets.
3. Build dynamic web pages using JavaScript (Client side programming).
4. Create XML documents and Schemas.
5. Build interactive web applications using AJAX.

**Detailed contents**

***Module 1: Networking Protocols and Internet***

Introduction, Protocols in Computer Communications, the OSI Model, OSI Layer Functions. Why Internet Working?, Problems in Internet Working, Dealing with Incompatibility Issues, A Virtual Network, Internet Working Devices, Repeaters, Bridges, Routers, Gateways, A Brief History of the Internet, Growth of the Internet.

***Module 2: WWW, HTTP, TELNET***

Introduction, Brief History of WWW, the Basics of WWW and Browsing, Hyper Text Markup Language, Common Gateway Interface, Remote Login.

***Module 3: JavaScript and AJAX***

Introduction, JavaScript, Basic Concepts, Controlling JavaScript Execution, Miscellaneous Features, JavaScript and Form Processing, Pop-up Boxes. AJAX: Introduction, How AJAX Works? , Life without AJAX, AJAX Coding, Life with AJAX.

***Module 4: Introduction to XML***

What is XML?, XML versus HTML, Electronic Data Interchange, XML Terminology, Introduction to DTD, Document-Type Declaration, Element-Type Declaration, Attribute Declaration, Limitations of DTDs, Introduction to Schema, Complex Types, Extensible Style sheet Language Transformations, Basics of Parsing, JAXP.

***Module 5: Creating Good Web Pages***

Introduction, Top Level Navigation, Creating Sample Layouts, Metaphor, Theme, and Storyboard, Screen Resolution,3-Column Layout, Using Frameworks, Using Graphics, Usability for the Handheld Devices, Creating Multilingual Web sites, XHTML and Web Browser Compatibility Issues, Designing the Basic Elements of a Home Page.

**Text/Reference Books:**


1. Achyut Godbole, AtulKahate"WebTechnologies:TCP/IP,Web/Java Programming, and Cloud Computing",ThirdEdition,McGraw Hill Education.
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How to Program", Third Edition, Pearson Education, 2006.
3. Raj Kamal, "Internet and Web Technologies", Tata McGraw-Hill


| **Subject Name: Project & Thesis** | **Subject Code: BTCCSPROJ801** | **Subject Credit:10** |
|---|---|---|

**Laboratory Objectives:**

The objective of Project III is to complete the Final Year project and is to publish the work in any seminar/ conference/Journal/Consortium

**Laboratory Outcomes:**

Prepare the project documents and complete the project.
Possibly students may apply for the grants for the further research work to extend the work in advanced stage.

| Subject Name: General Viva Voice | Subject Code: BTCCSPPC801 | Subject Credit:0 |
|---|---|---|