**AC 6/6/2012**
**Item No. 4.76**

# UNIVERSITY OF MUMBAI

## Bachelor of Engineering

**First Year Engineering ( Semester I & II), Revised course (REV- 2012) from Academic Year 2012 -13, (Common for All Branches of Engineering)**

(As per Credit Based Semester and Grading System with effect from the academic year 2012–2013)

# First Year Engineering ( Semester I & II), Revised course from Academic Year 2012 -13, (REV- 2012),

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC101 | Applied Mathematics-I | 04 | - | 01 | 04 | | 01 | 05 |
| FEC102 | Applied Physics-I | 03 | 01 | - | 03 | 0.5 | - | 3.5 |
| FEC103 | Applied Chemistry -I | 03 | 01 | - | 03 | 0.5 | - | 3.5 |
| FEC104 | Engineering Mechanics | 05 | 02 | - | 05 | 01 | - | 06 |
| FEC105 | Basic Electrical & Electronics Engineering | 04 | 02 | - | 04 | 01 | - | 05 |
| FEC106 | Environmental studies | 02 | - | - | 02 | - | - | 02 |
| FEL101 | Basic Workshop Practice-I | - | 04 | - | - | 02 | - | 02 |
| | | 21 | 10 | 01 | 21 | 05 | 01 | 27 |

## (Common for all branches of Engineering)

## Scheme for FE - Semester - I

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC101 | Applied Mathematics-I | 20 | 20 | 20 | 80 | 25 | - | - | 125 |
| FEC102 | Applied Physics-I | 15 | 15 | 15 | 60 | 25 | - | - | 100 |
| FEC103 | Applied Chemistry -I | 15 | 15 | 15 | 60 | 25 | - | - | 100 |
| FEC104 | Engineering Mechanics | 20 | 20 | 20 | 80 | 25 | - | 25 | 150 |
| FEC105 | Basic Electrical & Electronics Engineering | 20 | 20 | 20 | 80 | 25 | - | 25 | 150 |
| FEC106 | Environmental studies | 15 | 15 | 15 | 60 | - | - | - | 75 |
| FEL101 | Basic Workshop Practice-I | - | - | - | - | 50 | - | - | 50 |
| | | | | 105 | 420 | 175 | | 50 | 750 |

# First Year Engineering ( Semester I & II), Revised course from Academic Year 2012 -13, (REV- 2012), (Common for all branches)

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC201 | Applied Mathematics-II | 04 | - | 01 | 04 | | 01 | 05 |
| FEC202 | Applied Physics-II | 03 | 01 | - | 03 | 0.5 | - | 3.5 |
| FEC203 | Applied Chemistry -II | 03 | 01 | - | 03 | 0.5 | | 3.5 |
| FEC204 | Engineering Drawing | 03 | 04 | - | 03 | 02 | - | 05 |
| FEC205 | Structured Programming Approach | 04 | 02 | - | 04 | 01 | - | 05 |
| FEC206 | Communication Skills | 02 | 02 | - | 02 | 01 | - | 03 |
| FEL201 | Basic Workshop Practice -II | - | 04 | - | - | 02 | - | 02 |
| | | 19 | 14 | 01 | 19 | 07 | 01 | 27 |

## Scheme for Semester - II

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory marks | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Av. of Test 1 & 2 | | | | | |
| FEC201 | Applied Mathematics-II | 20 | 20 | 20 | 80 | 25 | - | - | 125 |
| FEC202 | Applied Physics-II | 15 | 15 | 15 | 60 | 25 | - | - | 100 |
| FEC203 | Applied Chemistry -II | 15 | 15 | 15 | 60 | 25 | - | - | 100 |
| FEC204 | Engineering Drawing | 15 | 15 | 15 | 60 | 25 | 50 | - | 150 |
| FEC205 | Structured Programming Approach | 20 | 20 | 20 | 80 | 25 | 25 | - | 150 |
| FEC206 | Communication Skills | 10 | 10 | 10 | 40 | 25 | - | - | 75 |
| FEL201 | Basic Workshop Practice-II | - | - | - | - | 50 | - | - | 50 |
| | | | | 95 | 380 | 200 | 75 | | 750 |

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC101 | **Applied Mathematics-I** | 04 | - | 01 | 04 | | 01 | 05 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | Term Work | Prat. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Av. of Test 1 & 2 | | | | | |
| FEC101 | **Applied Mathematics-I** | 20 | 20 | 20 | 80 | 25 | - | - | 125 |

**Detailed Syllabus**

| Sr.No | Topics | Hrs |
|---|---|---|
| 1 | Pre-requisite: **Review on Complex Number-**Algebra of Complex Number, Different representations of a Complex number and other definitions, D'Moivre's Theorem.<br><br>**Module-1**: Complex Numbers:-<br><br>1.1: Powers and Roots of Exponential and Trigonometric Functions.<br><br>1.2: Circular functions of complex number and Hyperbolic functions.Inverse Circular and Inverse Hyperbolic functions. Logarithmic functions.<br><br>1.3: Separation of real and Imaginary parts of all types of Functions.<br><br>1.4: Expansion of $\sin^n\theta, \cos^n\theta$ in terms of sines and cosines of multiples of θ and Expansion of sinnθ, cosnθ in powers of sinθ, cosθ | **2hrs**<br><br>**2 hrs**<br><br>**6 hrs**<br><br>**3 hrs**<br><br>**2 hrs** |

| | | |
|---|---|---|
| 2 | **Module-2**: Matrices and Numerical Methods:-<br><br>2.1: Types of Matrices(symmetric, skew- symmetric, Hermitian, Skew Hermitian,Unitary, Orthogonal Matrices and properties of Matrices).Rank of a Matrix using Echelon forms, reduction to normal form, PAQ forms, system of homogeneous and non –homogeneous equations, their consistency and solutions. Linear dependent and independent vectors.<br><br>2.2: Solution of system of linear algebraic equations, by (1) Gauss Elimination Method (Review) (2) Guass Jordan Method (3) Crouts Method (LU) (4) Gauss Seidal Method and (5) Jacobi iteration **(Scilab programming for above methods is to be taught during lecture hours)** | **9 hrs**<br><br>**6 hrs** |
| 3 | **Module-3**:Differential Calculus:-<br><br>3.1: Successive differentiation: nth derivative of standard functions. Leibnitz's Thoerem (without proof) and problems.<br><br>3.2: Partial Differentiation: Partial derivatives of first and higher order, total differentials, differentiation of composite and implicit functions.<br><br>3.3: Euler's Theorem on Homogeneous functions with two and three independent variables (with proof).Deductions from Euler's Theorem. | 5 **hrs**<br><br>7 **hrs**<br><br>3 **hrs** |
| 4 | **Module-4**: Application of Partial differentiation, Expansion of functions , Indeterminate forms and curve fitting:-<br><br>3.1.: Maxima and Minima of a function of two independent variables. Lagrange's method of undetermined multipliers with one constraint. Jacobian, Jacobian of implicit function. Partial derivative of implicit function using jacobian.<br><br>3.2: Taylor's Theorem(Statement only) and Taylor's series, Maclaurin's series (Statement only).Expansion of $e^x$, sinx, cosx, tanx, sinhx, coshx, tanhx, log(1+x), $\sin^{-1}x$, $\cos^{1}x$, Binomial series. Indeterminate forms, L-Hospital Rule, problems involving series also.<br><br>3.3: Fitting of curves by least square method for linear, parabolic, and exponential. Regression Analysis(to be introduced for estimation only) **(Scilab programming related to fitting of curves is to be taught during lecture hours)** | 4 **hrs**<br><br>6 **hrs**<br><br>5 **hrs** |

**Recommended Books**:

1: A text book of Applied Mathematics, P.N.Wartikar and J.N.Wartikar,Vol – I and –II by Pune Vidyarthi Graha.

2: Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication

3: Advanced Engineering Mathematics, Erwin Kreyszig, Wiley EasternLimited,9$^{th}$Ed.

4: Matrices by Shanti Narayan.

5: Numerical by S.S.Sastry, Prentice Hall

**Theory Examination**:

1. Question paper will comprise of 6 questions, each carrying 20 marks.

2. Total 4 questions need to be solved.

3: Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4: Remaining question will be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each

Module.

**Term Work**:

**General Instructions**:

(1) Batch wise tutorials are to be conducted. The number of students per batch should

be as per University pattern for practicals.

(2) Students must be encouraged to write Scilab Programs in tutorial class only. Each

Student has to write **at least 4 Scilab tutorials (including print out) and at least**

**6 class tutorials on entire syllabus**.

(3) SciLab Tutorials will be based on (1) Guass Jordan Method (2) Crouts

Method (LU) (3) Guass Seidal Method and (4) Jacobi iteration (5) Curve Fitting

for linear, parabolic and exponential functions

**The distribution of marks for term work will be as follows,**

Attendance (Theory and Tutorial) :05 marks

Class Tutorials on entire syllabus :10 marks

SciLab Tutorials :10

The final certification and acceptance of term-work ensures the satisfactory

Performance of laboratory work and minimum passing in the term work.

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC102 | **Applied Physics-I** | 03 | 01 | - | 03 | 0.5 | - | 3.5 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory (out of 75) | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment (out of 15) | | | End sem. exam (out of 60) | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC102 | **Applied Physics-I** | 15 | 15 | 15 | 60 | 25 | - | - | 100 |

**Detailed Syllabus:**

**1. CRYSTAL STRUCTURE (15)**

Crystallography: Space lattice, Unit Cell, Lattice parameters, Bravais lattices and Crystal systems, Cubic crystal system & lattices; Density & Packing Fraction; Miller indices of crystallographic planes & directions; interplanar distance; Diamond structure, NaCl structure, HCP structure, $BaTiO_3$ structure; Ligancy and Critical radius ratio; Determination of crystal structure using X-ray diffraction techniques viz. Laue method, rotating crystal method (Bragg method) & powder method; Real crystals & point-defects; photonic crystals; Liquid crystal phases and application in LCD ( with brief introduction of optical polarization).

**2. SEMICONDUCTOR PHYSICS (14)**

Energy bands of solids and classification of solids; Concepts of holes, effective mass; drift mobility and conductivity in conductors, intrinsic semiconductors and extrinsic semiconductors; Fermi-Dirac distribution function and Fermi energy level in a conductor, insulator, intrinsic & extrinsic semiconductor; Effect of impurity concentration and temperature on the Fermi Level; Hall Effect (applied electric field along x-axis and applied magnetic field along z-axis) and its application.

Drift and Diffusion of charge carriers across the Energy band structure of P-N Junction leading to formation of depletion region and potential barrier; concept of carrier current densities in p-n junction in

equilibrium, forward bias and reverse bias; Uses of p-n junction in Light emitting diode (LED), photoconductors & photovoltaic solar cells.

**3. DIELECTRICS & MAGNETIC MATERIALS (09)**

Dielectric material, dielectric constant, polarization, polarizability & its types; relative permittivity; Piezoelectrics, Ferroelectrics, Applications of dielectric materials - Requirement of good insulating material, some important insulating material.

Origin of magnetization using Atomic Theory; classification of magnetic materials based on Susceptibility value; Qualitative treatment of Langevin's and Weiss equation for Dia, Para and Ferro magnetic materials (no derivation); Microstructure of ferromagnetic solids- Domains and Hysteresis loss; Soft & hard magnetic materials and their uses; Magnetic circuits and microscopic Ohm's Law.

**4. ACOUSTICS & ULTRASONICS: (07 )**

Introduction to architectural acoustics; reverberation and Sabine's formula; Common Acoustic defects and Acoustic Design of a hall

Ultrasonic Waves and their applications; Methods of production of ultrasonic waves (Piezoelectric Oscillator & Magnetostriction Oscillator)

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**Books Recommended:**


1. A Textbook of Engineering physics - Avadhanulu & Kshirsagar, S.Chand
2. Applied Solid State Physics - Rajnikant, Wiley india
3. Engineering Physics- Uma Mukherji ( third edition), Narosa
4. Engineering Physics - R.K.Gaur & S.L. Gupta, Dhanpat Rai publications
5. Solid State physics - A.J. Dekker, Macmillan Student Edition
6. Modern Engineering Physics – Vasudeva, S.Chand
7. Solid State Physics- Charles kittle, EEE Pbl
8. Concepts of Modern Physics- Arther Beiser, Tata Mcgraw Hill


**Suggested Experiments: (Any five)**

1. Study of SC, BCC, FCC.
2. Study of Diamond, NaCl ,$BaTiO_3$.
3. Study of HCP structure.

4. Study of Miller Indices Plane and direction.
5. Study of Hall Effect.
6. Determination of energy band gap of semiconductor.
7. Determination of ‘h’ using photocell.
8. Study of Ultrasonic Distance Metre.
9. Determination of losses using hysteresis loop.
10. Study of I / V characteristics of semiconductor diode.

**Note: Distribution of marks for term work**

1. Laboratory work (Experiments and Journal): 15 marks
2. Assignments :05 marks
3. Attendance (Practical and Theory): 05marks

**Theory Examination**:

1. Question paper will comprise of 6 questions, each carrying 15 marks.

2. Total 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4: Remaining question will be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each Module.

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC103 | **Applied Chemistry - I** | 03 | 01 | - | 03 | 0.5 | - | 3.5 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory (out of 75) | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment (out of 15) | | | End sem. exam (out of 60) | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC103 | **Applied Chemistry - I** | 15 | 15 | 15 | 60 | 25 | - | - | 100 |

**Details of the syllabus:-**

| Sr. No. | Details | Hrs |
|---|---|---|
| Module 1 | **Water:**<br>• Impurities in water, Hardness of water, Determination of Hardness of water by EDTA method and problems. Softening of water by Hot cold lime soda method and problems. Zeolite process and problems. Ion Exchange process and problems.<br>• **Drinking water or Municipal water,** Treatments removal of microorganisms, by adding Bleaching powder, Chlorination ( no breakpoint chlorination), Disinfection by Ozone, Electrodialysis and Reverse osmosis, ultra filtration.<br>• **BOD, COD**( def,& significance), sewage treatments activated sludge process, numerical problems related to COD. | 12 |

| | | |
|---|---|---|
| Module<br><br>2 | **Polymers:**<br><br>• Introduction to polymers, Thermoplastic and Thermosetting plastic.<br>• Ingredients of the plastic (Compounding of plastic.)<br>• Fabrication of plastic by Compression, Injection , Transfer, Extrusion molding. Preparation, properties and uses of Phenolformaldehyde, PMMA , Kevlar.<br>• Effect of heat on the polymers (Glass transition temperatures) Polymers in medicine and surgery.<br>• Conducting polymers, Industrial polymers.<br>**Rubbers:**<br><br>• Natural rubber (latex), Drawbacks of natural rubber, Compounding of rubber (vulcanization of rubber), Preparation, properties and uses of Buna-S, Silicone and Polyurethane rubber. | 12 |
| Module<br><br>3 | **Lubricants**<br><br>• Introduction , Definition, Mechanism of Lubrication, Classification of lubricants, Solid lubricants (graphite & Molybdenum disulphide ) , Semisolid lubricants (greases Na base , Li base , Ca base, Axle greases.) , Liquid lubricants( blended oils ).<br>• Important properties of lubricants , definition and significance ,viscosity ,viscosity index, flash and fire points, cloud and pour points, oiliness, Emulsification, Acid value and problems, Saponification value and problems . | 08 |
| Module<br><br>4 | **Phase Rule**<br><br>• Gibb's Phase Rule, Explanation, One Component System (Water) , Reduced Phase Rule, Two Component System (Pb-Ag), Limitations of Phase Rule. | 05 |
| Module<br><br>5 | **Important Engineering Materials**<br><br>• **Cement**- Manufacture of Portland Cement, Chemical Composition and Constitution of Portland Cement , Setting and Hardening of Portland Cement, Concrete RCC and Decay**. Refractories** Preparation, properties and uses of Silica bricks, Dolomite bricks , Silicon Carbide (SiC).<br>• **Nanomaterials** , preparation (Laser and CVD method), properties and uses of CNTS | 08 |

**Theory Examination**:

1. Question paper will comprise of total 6 questions, each of 15 marks.

2. Total four questions need to be solved.

3. Question - 1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4. Remaining questions will be mixed in nature ( for example suppose Q.2 has part (a) from module 3 then part (b) will be form any module other than module 3).

5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

**Term work:**

Term work shall consist of minimum five experiments. The distribution of marks for term work shall be as follows:

Laboratory Work (Experiments and journal) : 10 marks

Attendance (Practical and Theory) : 05 marks

Assignments : 10 marks

Total : 25 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

| **Suggested Experiments - Applied Chemistry I** |
|---|
| 1) To determine total, temporary and permanent hardness of water sample. |
| 2) Removal of hardness using ion exchange column. |
| 3) To determine Saponification value of a lubricating oil. |
| 4) To determine acid value of a lubricating oil. |
| 5) To determine free acid PH of different solutions using PH meter / Titration. |
| 6) To determine metal ion concentration using colorimeter. |
| 7) To determine flash point and fire point of a lubricating oil |
| 8) To determine Chloride content of water by Mohr's Method. |
| 9) To determine melting point and/or glass transition temperature of a polymer. |

| |
|---|
| 10) To determine conductance of polymer. |
| 11) To determine the percentage of lime in cement. |
| 12) Hardening and setting of cement using Vicat's apparatus |
| 13) To determine the COD of the given water sample. / Dichromate method. |
| 14) Viscosity by Redwood Viscometer. |

**Recommended Books:**


1. Engineering Chemistry – Jain & Jain, Dhanpat Rai
2. Engineering Chemistry – Dara & Dara, S Chand
3. Engineering Chemistry – Wiley India (ISBN-9788126519880)
4. A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai)

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC104 | **Engineering Mechanics** | 05 | 02 | - | 05 | 01 | - | 06 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory (out of 100) | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment (out of 20) | | | End sem. exam (out of 80) | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC104 | **Engineering Mechanics** | 20 | 20 | 20 | 80 | 25 | - | 25 | 150 |

**Details of Syllabus:**

| **Sr.No.** | **Topics** | Hrs |
|---|---|---|
| **01** | **1.1 System of Coplanar forces:-**<br>Resultant of Concurrent forces, Parallel forces, Non Concurrent<br>Non Parallel system of forces, Moment of force about a point, Couples, Varignon's Theorem. Distributed Forces in plane.<br><br>**1.2 Center of Gravity and Centroid** for plane Laminas. | **05**<br><br>**04** |
| **02** | **2.1 Equilibrium of system of coplanar forces**:-<br>Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples.<br><br>**2.2 Types of support**, loads, Beams, Determination of reactions at supports for various types of loads on beams.<br><br>**2.3 Analysis of plane trusses** by using Method of joints and Method of sections.(Excluding pin jointed frames) | **06**<br><br>**04**<br><br>**04** |
| **03** | **3.1 Forces in space**:<br>**Resultant of Noncoplanar force systems:** Resultant of Concurrent force system, Parallel force system and Nonconcurrent nonparallel force system. | **05** |

| | | |
|---|---|---|
| | **Equilibrium of Noncoplanar force systems:** Equilibrium of Concurrent force system, Parallel force system and Nonconcurrent nonparallel force system.<br><br>**3.2 Friction**:<br>Introduction to Laws of friction, Cone of friction, Equilibrium of bodies on inclined plane, Application to problems involving wedges, ladders. | **06** |
| **04** | **4.1 Kinematics of Particle**: - Velocity & acceleration in terms of rectangular co-ordinate system, Rectilinear motion, Motion along plane curved path, Tangential & Normal component of acceleration, Motion curves (a-t, v-t, s-t curves), Projectile motion, Relative velocities. | **10** |
| **05** | **5.1 Kinematics of Rigid Bodies** :- Introduction to general plane motion, Instantaneous center of rotation for the velocity, velocity diagrams for bodies in plane motion, (up to 2 linkage mechanism) | **06** |
| **06** | **6.1 Kinetics of a Particle: Force and Acceleration:-** Introduction to basic concepts, D'Alemberts Principle, Equations of dynamic equilibrium, Newton's Second law of motion.<br><br>**6.2 Kinetics of a Particle: Work and Energy: -**Principle of Work and Energy, Law of Conservation of Energy.<br><br>**6.3 Kinetics of a Particle: Impulse and Momentum:**-Principle of Linear Impulse and Momentum. Law of Conservation of momentum. Impact and collision. | **04**<br><br>**03**<br><br>**03** |

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.

2. Total 4 questions need to be solved.

3: Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4. Remaining questions will be mixed in nature.( e.g. Suppose Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3 ) having 15 marks each.

5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

**Oral examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Term work shall consist of minimum six experiments, assignments consisting numerical based on above syllabus, at least 3 numerical from each module.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiment/ programs and journal) **:10 marks**

Assignments : **10 marks**

Attendance (Theory and Practical) **: 05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

**List of experiments:-**

1. Polygon law of coplanar forces.
2. Non concurrent non parallel (general).
3. Bell crank lever.
4. Support reaction for beam.
5. Simple / compound pendulum.
6. Inclined plane (to determine coefficient of friction).
7. Collision of elastic bodies (Law of conservation of momentum).
8. Moment of Inertia of fly wheel.
9. Screw friction by using screw jack.

Any other experiment based on above syllabus.

**Recommended Books**


1. Engineering Mechanics by Hibblar, McMillan.
2. Engineering Mechanics by Beer & Johnson, Tata McGraw Hill
3. Engineering Mechanics by Merium, Wiley.
4. Engineering Mechanics by F. L. Singer, Harper & Raw Publication
5. Engineering Mechanics by Macklin & Nelson, Tata McGraw Hill
6. Engineering Mechanics by Shaum Series,
7. Engineering Mechanics by Tayal, Umesh Publication.

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC105 | **Basic Electrical & Electronics Engineering** | 04 | 02 | - | 04 | 01 | - | 05 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory (out of 100) | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment (out of 20) | | | End sem. exam (out of 80) | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC105 | **Basic Electrical & Electronics Engineering** | 20 | 20 | 20 | 80 | 25 | - | 25 | 150 |

**Detailed Syllabus:**

| Module | Content | Hours |
|---|---|---|
| **Prerequisite** | **A.** Concept of e.m.f, potential difference, current, ohm's law, resistance, resistivity, series and parallel connections, power dissipation in resistance, effect of temperature on resistance<br>**B.** Capacitors, with uniform and composite medium, energy stored in capacitor, R-C time constant.<br>**C.** Magnetic field, Faraday's laws of Electromagnetic induction, Hysterics and eddy current losses, energy stored in an inductor, time constant in R-L circuit. | No questions to be asked in Theory paper on Prerequisite<br>02 |
| 1 | **D.C. circuits:** (only independent sources).<br>Kirchhoff 's laws, Ideal and practical voltage and current source, Mesh and Nodal analysis (super node and super mesh excluded), Source transformation, Star-delta transformation ,Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, (Source transformation not allowed for Superposition theorem, Mesh and Nodal analysis) | 20 |

| | | |
|---|---|---|
| 2 | **A.C Circuits :**<br>Generation of alternating voltage and currents, RMS and Average value, form factor , crest factor, AC through resistance, inductance and capacitance, R-L , R-C and R-L-C series and parallel circuits, phasor diagrams , power and power factor, series and parallel resonance, Q-factor and bandwidth | 12 |
| 3 | **Three phase circuits :**<br>Three phase voltage and current generation, star and delta connections (balanced load only), relationship between phase and line currents and voltages, Phasor diagrams, Basic principle of wattmeter, measurement of power by two wattmeter method | 10 |
| 4 | **Single phase transformer :**<br>Construction, working principle, Emf equation, ideal and practical transformer, transformer on no load and on load, phasor diagrams, equivalent circuit, O.C. and S.C test, Efficiency | 10 |
| 5 | **Electronics** (no numericals):<br>Semiconductor diode, Diode rectifier with R load: Half wave, full wave– center tapped and bridge configuration, RMS value and average value of output voltage, ripple factor, rectification efficiency, introduction to C and L filter (no derivation). CE, CB, CC transistor configuration, CE input-output characteristics. | 06 |

**Theory Examination**:

1. Question paper will comprise of 6 questions, each carrying 20 marks.

2. Total 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4: Remaining question will be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each

Module.

**List of laboratory experiments (Minimum Six):**

1. Mesh and Nodal analysis.
2. Verification of Superposition Theorem.
3. Verification Thevenin's Theorem.
4. Study of R-L series and R-C series circuit.
5. R-L-C series resonance circuit
6. R-L-C parallel resonance circuit.
6. Relationship between phase and line currents and voltages in 3 – phase System (star & delta)

7. Power and phase measurement in three phase system by two wattmeter method.
8. O.C. and S.C. test on single phase transformer
9. Half wave and full wave rectifier circuits

***Recommended Books***

***Text Books***


1. V. N. Mittal and Arvind Mittal “Basic Electrical Engineering” Tata McGraw Hill, (Revised Edition)
2. Electrical Engineering Fundamentals" by Vincent Del Toro, PHI Second edition ,2011
3. Electronics Devices & Circuit Theory" by Boylestad, Pearson Education India
4. Edward Hughes: Electrical and Electrical Technology, Pearson Education (Tenth edition)
5. D P Kothari and I J Nagrath “Theory and Problems of Basic Electrical Engineering”, PHI 13 th edition 2011.


***Reference Books:***


1. B.L.Theraja “Electrical Engineering “ Vol-I and II,
2. S.N.Singh, “Basic Electrical Engineering” PHI , 2011

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| 6 | **Environmental studies** | 02 | - | - | 02 | - | - | 02 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory (out of 75) | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment (out of 15) | | | End sem. exam (out of 60) | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| 6 | **Environmental studies** | 15 | 15 | 15 | 60 | - | - | - | 75 |

**Details of the syllabus:-**

| Sr. No. | Details | Hrs |
|---|---|---|
| Module 1 | **Multidisciplinary Nature of Environmental Studies:**<br>• Scope and Importance<br>• Need for Public Awareness<br>• Depleting Nature of Environmental resources such as Soil, Water, Minerals, and Forests.<br>• Global Environmental Crisis related to Population, Water, Sanitation and Land.<br>• Ecosystem: Concept, Classification, Structure of Ecosystem, overview of Food chain, Food web and Ecological Pyramid | 04 |

| | | |
|---|---|---|
| Module<br><br>2 | **Sustainable Development**<br><br>• Concept of sustainable development<br>• Social, Economical and Environmental aspect of sustainable development.<br>• Control Measures: 3R (Reuse, Recovery, Recycle), Appropriate Technology, Environmental education, Resource utilization as per the carrying capacity**.** | 04 |
| Module<br><br>3 | **Environmental Pollution:**<br><br>• Air Pollution: Sources, Effects of air pollution with respect to Global Warming, Ozone layer Depletion, Acid Rain,<br><br>Photochemical smog, Two Control Measures- Bag house Filter, Venturi scrubber .<br><br>Case Study: Bhopal Gas Tragedy<br><br>• Water Pollution: Sources and Treatment, Concept of waste waters - Domestic &Industrial and treatment.<br>Case Study: Minamata Disease.<br><br>• Land Pollution: Solid waste, Solid waste Management by Land filling, Composting.<br>• Noise Pollution; Sources and Effects<br>• E-Pollution: Sources and Effects. | 07 |
| Module<br><br>4 | **Environmental Legislation:**<br><br>• Overview<br>• Ministry of Environment and Forests (MoE&F). Organizational structure of MoE&F.<br>• Functions and powers of Central Control Pollution Board.<br>• Functions and powers of State Control Pollution Board.<br>• Environmental Clearance, Consent and Authorization Mechanism.<br>• Environmental Protection Act<br>• Any two case studies pertaining to Environmental Legislation. | 05 |
| Module<br><br>5 | **Renewable sources of Energy:**<br><br>• Limitations of conventional sources of Energy.<br>• Various renewable energy sources.<br>• Solar Energy: Principle, Working of Flat plate collector & Photovoltaic cell.<br>• Wind Energy: Principle, Wind Turbines. | 05 |

| | | |
|---|---|---|
| | • Hydel Energy: Principle, Hydropower generation.<br>• Geothermal Energy: Introduction, Steam Power Plant | |
| Module<br><br>6 | **Environment and Technology**<br><br>• Role of Technology in Environment and health<br>• Concept of Green Buildings, Indoor air pollution<br>• Carbon Credit: Introduction, General concept.<br>• Disaster Management: Two Events: Tsunami, Earthquakes, Techniques of Disaster Management<br>• Case Study: Earthquake in Japan | 05 |

**Theory Examination**:

1. Question paper will comprise of **total 6 questions**, **each** of **15 marks**.

2. Total **four questions** need to be solved.

3. Question **Number One** will be **compulsory** and it will be based **on entire syllabus** wherein sub questions of 2 to 3 marks will be asked.

4. Remaining questions i.e Q.2 to Q.6 will be mixed in nature and will be divided in three parts (a),(b) &(c) and they will belong to different modules.

5. In question paper, weight of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

**Recommended Books:**


1. Textbook of Environmental studies by Erach Bharucha, University Press.
2. Environmental Studies by R.Rajagopalan, Oxford University Press.
3. Essentials of Environmental Studies by Kurian Joseph &Nagendran, Pearson Education
4. Renewable Energy by Godfrey Boyle, Oxford Publications.
5. Perspective Of Environmental Studies, by Kaushik and Kaushik,New Age International
6. Environmental Studies by. Anandita Basak, Pearson Education
7. Textbook of Environmental Studies by Dave and Katewa, Cengage Learning
8. Environmental Studies by Benny Joseph, TataMcGraw Hill

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEL101 | **Basic Workshop Practice - I** | - | 04 | - | - | 02 | - | 02 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEL101 | **Basic Workshop Practice-I** | - | - | - | - | 50 | - | - | 50 |

| Detailed Syllabus | | Periods |
|---|---|---|
| Note: | The syllabus and the Term- work to be done during semester I and Semester II is given together. Individual Instructor for the course is to design the jobs for practice and demonstration and spread the work over entire two semesters. The objective is to impart training to help the students develop engineering skill sets. This exercise also aims in inculcating respect for physical work and hard labor in addition to some amount of value addition by getting exposed to interdisciplinary engineering domains.<br>The two compulsory trades (Sr. No. 1- Fitting and 2 - Carpentry) shall be offered in separate semesters.<br>Select any four trade topics (two per semester) out of the topic at Sr. n. 3 to 11. Demonstrations and hands on experience to be provided during the periods allotted for the same. Report on the demonstration including suitable sketches is also to be included in the term – work | |
| 1. | **Fitting (compulsory)**<br>• Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping.<br>• Term work to include one job involving following operations : filing to size, one simple male- female joint, drilling and tapping | 30 |

| | | |
|---|---|---|
| 2. | **Carpentry (compulsory)**<br>• Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods.<br>• Term work to include one carpentry job involving a joint and report on demonstration of a job involving wood turning | 30 |
| 3. | **Forging (Smithy)**<br>• At least one workshop practice job (Lifting hook and handle) is to be demonstrated. | 15 |
| 4. | **Welding**<br>• Edge preparation for welding jobs. Arc welding for different job like, Lap welding of two plates, butt welding of plates with simple cover, arc welding to join plates at right angles. | 15 |
| 5. | **Machine Shop**<br>• At least one turning job is to be demonstrated. | 15 |
| 6. | **Electrical board wiring**<br>• House wiring, staircase wiring, wiring diagram for fluorescent tube light, Godown wiring and three phase wiring for electrical motors. | 15 |
| 7. | **PCB Laboratory Exercises**<br>Layout drawing, Positive and negative film making, PCB etching and drilling, Tinning and soldering technique. | 15 |
| 8. | **Sheet metal working and Brazing**<br>• Use of sheet metal, working hand tools, cutting , bending , spot welding | 15 |
| 9. | **Plumbing**<br>• Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic line involving fixing of a water tap and use of coupling, elbow, tee, and union etc. | 15 |
| 10. | **Masonry**<br>• Use of masons tools like trowels, hammer, spirit level, square, plumb line and pins etc. demonstration of mortar making, single and one and half brick masonry , English and Flemish bonds, block masonry, pointing and plastering. | 15 |

| | | |
|---|---|---|
| 11 | **Hardware and Networking:**<br>• Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc.<br>• Assembling of PC, Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one)<br>• Basic troubleshooting and maintenance<br>• Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping.<br><br>**NOTE**: Hands on experience to be given in a group of not more than four students. | 15 |

**Term work:**

Term work shall consist of respective reports and jobs of the trades selected the distribution of marks for term work shall be as follows.

Laboratory work (Job and Journal) : 40 marks

Attendance (Practical and Theory) : 10 marks

The final certification and acceptance of term – work ensures the satisfactory performance of laboratory work.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC201 | **Applied Mathematics-II** | 04 | - | 01 | 04 | - | 01 | 05 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Prat | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC201 | **Applied Mathematics-II** | 20 | 20 | 20 | 80 | 25 | - | - | 125 |

**Detailed Syllabus:**

| Sr.No. | Topic | Hrs |
|---|---|---|
| 1 | Prerequiste: Idea of Curve tracing in cartesian, parametric and polar forms. Straight lines, Circles, Parabolas, Hyperbola, Catenary, Cissoid, Astroid, Cycloid, Lemniscate of Bernoulli, Cardiode. Concept of Solid Geometry -Planes, Spheres, Cones, Cylinders, Paraboloids (Tracing of curves by using SciLab).<br><br>**Module-1: Beta and Gamma functions, Differentiation under Integral sign and exact differential equation:**<br><br>1.1: Beta and Gamma functions and its properties. Differentiation under integral sign with constant limits of integration. | 2 **hrs**<br><br>5 **hrs** |

| | | |
|---|---|---|
| | 1.2: Rectification of plane curves.<br><br>1.3: Differential Equation of first order and first degree-Exact differential equations, Equations reducible to exact equations by integrating factors. | **4hrs**<br><br>4 **hrs** |
| 2 | **Module-2**: **Differential Calculus**<br><br>2.1: Linear differential equations(Review), equation reducible to linear form, Bernoulli's equation.<br><br>2.2: Linear Differential Eqaution with constant coeffiecient- Complimentary function, particular integrals of differential equation of the type f(D)y = X where X is $e^{ax}$, sin (ax+b), cos (ax+b), $x^n$, $e^{ax}V$, xV.<br><br>2.3: Cauchy's homogeneous linear differential equation and Legendre's differential equation, Method of variation of parameters.<br><br>2.4: Simple application of differential equation of first order and second order to electrical and Mechanical Engineering problem (no formulation of differential equation) | <br><br>2 **hrs**<br><br>6 **hrs**<br><br>4 **hrs**<br><br>3 **hrs** |
| 3 | **Module-3: Numerical solution of ordinary differential equations of first order and first degree and Multiple Integrals-**<br><br>3.1 :(a)Taylor's series method (b)Euler's method<br><br>(c) Modified Euler method (d) Runga-Kutta fourth order formula (SciLab programming is to be taught during lecture hours)<br><br>3.2:Multiple Integrals-Double integration-definition, Evaluation of Double Integrals, Change of order of integration, Evaluation of double integrals by changing the order of integration and changing to polar form (Examples on change of variables by using Jacobians only). | <br><br><br><br>5 **hrs**<br><br>10 **hrs** |

| | | |
|---|---|---|
| 4 | **Module -4:Multiple Integrals with Application and Numerical Integration:-**<br><br>4.1: Triple integration –definition and evaluation (Cartesian, cylindrical and spherical polar coordinates).<br><br>4.2: Application to double integrals to compute Area, Mass, Volume. Application of triple integral to compute volume.<br><br>4.3: Numerical integration-Different type of operators such as shift, forward, backward difference and their relation. Interpolation, Newton iterpolation, Newton-Cotes formula(with proof). Integration by (a) Trapezoidal (b) Simpson's $1/3^{rd}$ (c) Simpson's $3/8^{th}$ rule (all with proof). (Scilab programming on (a) (b) (c) (d) is to be taught during lecture hours) | 3 **hrs**<br><br>5 **hrs**<br><br>7 **hrs** |

**Recommended Books**:

1: A text book of Applied Mathematics, P. N. Wartikar and J. N. Wartikar, Vol –I and II by

Pune Vidyarthi Graha.

2: Higher Engineering Mathematics, Dr.B. S. Grewal, Khanna Publication

3: Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited,$9^{th}$ Ed.

4: Numerical Analysis by S.S.Sastry, Prentice Hall

5: Differential Equations, Sheply Ross, Wiley India.

**Theory Examination**:

1. Question paper will comprise of 6questions, each carrying 20 marks.

2. Total 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4: Remaining question should be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each module.

**Term Work**:

**General Instructions**:

(1) Batch wise tutorials are to be conducted. The number of students per batch should be as per University pattern for practicals.

(2) Students must be encouraged to write Scilab Programs during the tutorials. Each student has to write **at least 5 Scilab tutorials (including print out) and at least 5 class tutorials on entire syllabus**.

(3) SciLab Tutorials will be based on (1)Curve Tracing (2) from module3 on (a)Taylor's series method (b)Euler's method (c) Modified Euler method (d) Runga-Kutta fourth order formula (4) ordinary differential equation and (5) Trapezoidal ,Simpson's $1/3^{rd}$ and Simpson's $3/8^{th}$ rule.

The distribution of marks for term work will be as follows,

Attendance (Theory and Tutorial) : 05 marks

Class Tutorials on entire syllabus : 10 marks

SciLab Tutorials : 10

The final certification and acceptance of term-work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC202 | **Applied Physics - II** | 03 | 01 | - | 03 | 0.5 | - | 3.5 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | Term Work | Prat. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC202 | **Applied Physics - II** | 15 | 15 | 15 | 60 | 25 | - | - | 100 |

**1. INTERFERENCE AND DIFFRACTION OF LIGHT (15)**

Interference in thin film - Introduction, interference due to reflected and transmitted light by thin transparent parallel film; origin of colours in thin film; Wedge shaped thin film; Newton's rings;

Applications of interference - Determination of thickness of very thin wire or foil, determination of refractive index of liquid, wavelength of incident light , radius of curvature of lens, testing of surface flatness, non-reflecting films, Highly reflecting film

Diffraction of Light – Introduction; Fraunhoffer diffraction at single slit ; Fraunhoffer diffraction at ouble slit; diffraction due to N- slits ( Diffraction Grating), missing orders, Highest possible orders; determination of wavelength of light with a plane transmission grating; resolving power of a grating; dispersive power of a grating.

**2. FIBRE OPTICS AND LASERS: (09)**

**Fibre optics :** Introduction, total internal reflection, basic construction, optical fibre as light guide and types of optical fibre; Numerical Aperture and maximum angle of acceptance, Numerical Aperture for graded index fibre; V-number, Maximum number of possible orders; Losses in optical fibre; Merits of optical fibre; Applications.

**Lasers :** Quantum processes as absorption, spontaneous emission and stimulated emission; metastable states, population inversion, pumping, resonance cavity, Einsteins's equations; Helium Neon laser; Nd:YAG laser; Semiconductor laser,

Applications of laser- Holography (construction and reconstruction of holograms) and other applications.

**3. QUANTUM MECHANICS: (08)**

Introduction, Wave particle duality, de Broglie wavelength; experimental verification of de Broglie theory; properties of matter waves; wave packet, group velocity and phase velocity; Wave function, Physical interpretation of wave function; Heisenberg's uncertainty principle; Electron diffraction experiment and Gama ray microscope experiment; Applications of uncertainty principle; Schrodinger's time dependent wave equation, time independent wave equation, - Motion of free particle, Particle trapped in one dimensional infinite potential well.

**4. MOTION OF CHARGED PARTICLE IN ELECTRIC AND MAGNETIC FIELDS - (03)**

Electrostatic focusing; Magnetostatic focusing; Cathode ray tube (CRT); Cathod ray Oscilloscope (CRO); Application of of CRO,

**5. SUPERCONDUCTIVITY: (03)**

Introduction, Meissner Effect; Type I and Type II superconductors; BCS Theory(concept of Cooper pair); Josephson effect; Applications of superconductors- SQUID, MAGLEV

**6. NANOSCIENCE AND NANOTECHNOLOGY (07)**

Introduction to nano-science and nanotechnology; Two main approaches in nanotechnology - Bottom up technique and top down technique; Tools used in nanotechnology such as Scanning electron microscope, Scanning Tunneling Microscope, Atomic Force Microscope.

Nano materials: Methods to produce nanomaterials; Applications of nanomaterials; Different forms of carbon nanoparticles, carbon nanotubes, properties and applications.

**Books Recommended:**


1. A Textbook of Engineering physics - Avadhanulu & Kshirsagar, S.Chand
2. Engineering Physics- Uma Mukherji ( third edition), Narosa
3. Engineering Physics - R.K.Gaur & S.L. Gupta, Dhanpat Rai publications
4. Modern Engineering Physics – Vasudeva, S.Chand
5. Concepts of Modern Physics- Arther Beiser, Tata Mcgraw Hill
6. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
7. Optics - Ajay Ghatak, Tata Mc Graw Hill
8. Intoduction to Nanotechnology- Charles P. Poole, Jr., Frank J. Owens,Wiley India edition
9. Nano: The Essential – T. Pradeep, Mcgraw-Hill Education

**Suggested Experiments: (Any five)**

1. Determination of radius of curvature of a lens using Newton's ring set up
2. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
3. Determination of wavelength using Diffracion grating.(Hg/ Na source)
4. Determination of number of lines on the grating surface using Diffracion grating.
5. Determination of Numerical Aperture of an optical fibre.
6. Determination of wavelength using Diffracion grating.(Laser source)
7. Use of CRO for measurement of frequency and amplitude.
8. Use of CRO for measurement of phase angle.
9. Study of divergence of laser beam
10. Determination of width of a slit using single slit diffraction experiment(laser source)

**Note: Distribution of marks for term work**

1. Laboratory work (Experiments and Journal) : 15 marks
2. Assignments : 05 marks

2. Attendance (Practical and Theory): 05marks

**Theory Examination**:

1. Question paper will comprise of 6 questions, each carrying 15 marks.

2. Total 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4: Remaining question will be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each Module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC203 | **Applied Chemistry -II** | 03 | 01 | - | 03 | 0.5 | | 3.5 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Prat | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC203 | **Applied Chemistry -II** | 15 | 15 | 15 | 60 | 25 | - | - | 100 |

**Details of the syllabus:-**

| **Details** | **Hrs** |
|---|---|
| **Module 1:**<br><br>**Corrosion :**<br><br>• Introduction: Types of Corrosion (I) Dry or Chemical Corrosion i) Due to oxygen ii) due to other gases. (II) Wet or Electrochemical Corrosion :- Mechanism i) Evolution of hydrogen type ii) Absorption of oxygen. Types of Electro-Chemical Corrosion – Galvanic cell corrosion, Concentration cell corrosion (differential aeration), pitting corrosion, Intergranular corrosion, Stress Corrosion , Polarization.<br>• Factors affecting the rate of corrosion :- Nature of metal, position in galvanic series, potential difference, overvoltage, relative area of the anodic and cathodic parts, purity of metal, nature of the corrosion product, temperature, moisture, influence of PH, concentrations of the electrolytes. | 10 |

| | |
|---|---|
| • Methods to Decrease the rate of Corrosion :- Proper designing, using pure metal, using metal alloys, Cathodic protection – i) Sacrificial anodic protection, ii) Impressed current method, Anodic protection method, Metallic coatings, hot dipping , galvanizing, tinning, metal cladding, metal spraying, Electroplating, Cementation, Organic Coatings ,Paints only constituents and their functions. | |
| **Module 2 :**<br><br>**Alloys :**<br><br>• Introduction, purpose of making alloys, Ferrous Alloys, plain carbon steel, heat resisting steels, stainless steels (corrosion resistant steels), effect of the alloying element, Ni, Cr, Co, Mg, Mo, W, and V.<br>• Non-Ferrous Alloys- Alloys of Al – i) Duralumin ii) Magnalumin. **Alloys of Cu**-Brasses – i) Commercial brass ii) German Silver. Bronzes – i) Gun metal ii) High – phosphorus bronze. **Alloys of pb** – i) Wood's metal. ii) Tinman's solders. Their composition (Reference 1 by Jain & Jain ), properties & uses.<br>• **Powder Metallurgy** :- Introduction, methods of metal powder formation (1) (a) Mechanical pulverization (b) Atomization (c) Chemical reduction (d) Electrolytic process (e) Decomposition. (2) Mixing & blending (3) Sintering. (4) Compacting :- Various methods such as i) cold pressing. ii) Powder injection moulding. iii) Hot compaction.<br>• **Applications of powder metallurgy**.<br>• Manufacture of oxide & non-oxide ceramic powders only i) Alumina ii) Silicon Carbide | 09 |
| **Module 3 :**<br><br>**Fuels**<br><br>• Definition, Classification of fuels – solid, Liquid & Gaseous. Calorific value – def. Gross or Higher C.V. & Net or lower C.V. units of heat (no conversions). Dulong's formula & numericals for calculations of Gross & Net C.V. **Analysis of coal** – i) Proximate Analysis with numericals and its importance ii) Ultimate Analysis with numericals and its importance, Characteristic properties of the good fuel.<br>• **Liquid Fuels** – Crude petroleum oil; its composition & classification & mining (in brief). **Refining of crude oil** i) separation of water ii) Separation of 'S' & iii) Fractional distillation with diagram & composition table.<br>• **Cracking** – Definition; Types of cracking – I) **Thermal Cracking**– (a) Liquid phase thermal cracking b) Vapour phase thermal cracking. II) **Catalytic Cracking** – (a) Fixed – bed catalytic cracking (b) Moving – bed catalytic cracking. Advantages of Catalytic | 12 |

| | |
|---|---|
| Cracking.<br>• **Petrol :** Refining of petrol, unleaded petrol (MTBE use of catalytic converter), power alcohol. Knocking, Octane number (antiknocking agents), Cetane number<br>• **Combustion:** calculations for requirement of only oxygen & air (by weight & by volume only) for given solid, liquid & gaseous fuels.<br>• **Bio-diesel,** Method to obtain Biodiesel from vegetable oils (Trans-esterification), advantages and disadvantages of Biodiesel.<br>• **Propellants:** Definition, Characteristics of a good propellant, classification of propellants, Two examples each. | |
| **Module 4 :**<br>**Composite Materials and Adhesives :**<br>• **Introduction, Constitution** i) Matrix phase ii) Dispersed phase. Characteristic properties of composite materials Classification – A**) Particle** – reinforced composites i) Large – particle composites ii) Dispersion – strengthened Composites. B) **Fiber** – Reinforced Composites (i) Continuous aligned (ii) Discontinuous (short) (a) aligned (b) Randomly oriented. (C) **Structural Composites** – (i) Laminates (ii) Sandwich Panels.<br>**Adhesives :**<br>• Introduction, Adhesive action, Physical Factors Influencing Adhesive action, Chemical Factors Influencing, Adhesive action, Bonding Processes by adhesives. | 10 |
| **Module 5 :**<br>**Green Chemistry:**<br>• Introduction, Twelve Principles of Green chemistry, numericals on atom economy, synthesis , adipic acid and indigo.<br>• Green solvents (ionic liquid supercritical $CO_2$), and products from natural materials. | 04 |

**Theory Examination:**

1. Question paper will comprise of total 6 questions, each of 15 marks.

2. **Total four questions need to be solved**.

3**. Question 1 will be compulsory** and based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4. Remaining questions will be mixed in nature ( for example suppose Q.2 has part (a) from module 3 then part (b) will be form any module other than module 3.

5. In question paper weightage of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

**Term work:**

Term work shall consist of minimum five experiments. The distribution of marks for term work shall be as follows:

Laboratory Work (Experiments and journal) : 10 marks

Attendance (Practical and Theory) : 05 marks

Assignments : 10 marks

Total : 25marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

| **Suggested Experiments** | **Applied Chemistry-II** |
|---|---|
| Estimation of Zn Complexometric titration. | |
| Estimation of Ni complexometric titration. | |
| Estimation of Al complexometric titration. | |
| Calorific value of solid or liquid fuel using Bomb Calorimeter. | |
| Preparation of membranes for filter any one Demon. | |
| $CO_2$ from air by Orsats method. | |
| Estimation of Fe from plain C steel. | |
| Estimation of Ni by gravimetric method. | |
| Estimation of Sn iodometrically. | |
| Preparation of Bio diesel from edible oil. | |
| Synthesis of simple layered materials and their characterization. | |
| Preparing simple composites and their characterization. | |
| Estimation of Cu iodometrically. | |
| Estimate % of Moisture from coal. | |
| To de4termine the E cell of Cu-Zn system by potentiometry. | |

**Recommended Books:**

1. Engineering Chemistry – Jain & Jain, Dhanpat Rai
2. Engineering Chemistry – Dara & Dara, S Chand
3. Engineering Chemistry – Wiley India (ISBN-9788126519880)
4. A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai)

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC204 | **Engineering Drawing** | 03 | 04 | - | 03 | 02 | - | 05 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 and Test 2 | | | | | |
| FEC204 | **Engineering Drawing** | 15 | 15 | 15 | 60 | 25 | 50 | - | 150 |

## Preamble

Considering the recent practices in industries and easy availability of software this conventional drawing may be totally converted in to AutoCAD from the next revision.

## Objective of the course

1) Students should be able to visualize the objects.
2) They should be able to understand and read drawing.
3) They should be able to present the same.

| Module | Details | Hrs |
|---|---|---|
| 1 | Introduction to Engineering Drawing. Types of Lines, Dimensioning Systems as per IS conventions.<br>Engineering Curves: Basic construction of Cycloid, Involutes and Helix( of cylinder) only<br>****Introduction to Auto CAD**:- Basic Drawing and Editing Commands. Knowledge of setting up layers, Dimensioning, Hatching, plotting and Printing. | **3** |
| 2 | **Projection of Points and Lines:-**Lines inclined to both the Reference Planes. (Excluding Traces).<br>**@Projection of Planes:** Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to either HP or VP only. (Exclude composite planes) | **6** |

| | | |
|---|---|---|
| 3 | **Projection of Solids:** - (Prism, Pyramid, Cylinder, Cone only) Solid projection with the axis inclined to HP and VP. (Exclude Spheres , Composite and Hollow solids).. Use change of position or Auxiliary plane method<br>Section of solids:- section of Prism, Pyramid, Cylinder, &Cone , cut by plane perpendicular to at least one reference plane.( Exclude Curved section Plane). Use change of position or Auxiliary plane method<br><br>**Development of Surfaces:-** Lateral surface development of Prism, Pyramid, Cylinder, Cone with section plane inclined to HP or VP only. (Exclude Reverse Development) | **14** |
| 4 | **Orthographic projections:-**<br>• Different views of a simple machine part as per the first angle projection method recommended by I.S.<br>• Full or Half Sectional views of the Simple Machine parts.<br>• ****Drawing of orthographic projections using Auto CAD.** | **12** |
| 5 | Isometric Projections: Isometric projection/Drawing of blocks (plain and cylindrical excluding spheres).<br>• ****Drawing of Isometric projections using Auto CAD.**<br>• **@**Reading of orthographic projections. **(Only for TW)**<br>• ***Orthographic Reading using Auto CAD.**<br>****Introduction to 3D in AutoCAD**<br>Working in 3-dimensions, Viewing 3D Objects, Basic wireframe models, Extruding, simple revolved objects. Boolean operations.<br>Generation of orthographic projections from 3D drawing. | **10** |

****Should be covered during Auto CAD practical.**

**@ only in Term Work.(i.e:-Questions will not be asked for the examination.)**

**Term Work:**

**Component-1**

Sheet-1: Projection of Solids (2 problems) + Section and Development of solid surfaces (2 problem)

Sheet -2: Orthographic projection without section (2 problems).

Sheet -3: Orthographic projection with section (2 problems).

Sheet- 4: Isometric Projections (3 problems).

**Component -2**

One A-3 size sketch book consisting of:-

1) 3 problems each from Projection of Curves, Lines, Planes and Solids.
2) 3 problems from Section and Development of Solids.
3) 2 problems each from the Orthographic Projections (with Section), Reading of orthographic projections and Isometric projections.

**Component-3**

Printouts of minimum 2 problems **(preferably in A3 size sheet)** each from:

1) Simple Orthographic Projections.
2) Orthographic Projections – Section.
3) Isometric projections.
4) Reading of Orthographic Projections

**Note:-** 2 hrs /week Auto CAD Practical is essential for completing the Auto CAD Drawings and take required printouts.

**AutoCAD Examination: (2hrs):**

**1)** Minimum 1 problem from 1 or 2 or 4 of component-3 **and**
2) Minimum 1 problem from 3 of component-3.
3) Print out of the Answers have to be taken **preferably in A3 size sheets** and should be assessed by External examiner. Knowledge of concepts and accuracy of drawing should be considered during evaluation.

**Theory Examination**:

1. Question paper will comprise of 6 questions, each carrying 15 marks.

2. Only 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus.

4: Remaining question will be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each Module.

**Text Books.**


**1)** N.D. Bhatt, “Engineering Drawing (Plane and solid geometry)”, Charotar Publishing House Pvt. Ltd.

**2)** N.D. Bhatt & V.M. Panchal, “Machine Drawing”, Charotar Publishing House Pvt. Ltd.


**References.**


1) M.B Shah & B.C Rana, “Engineering Drawing”, Pearson Publications.

2) P.J. Shah, “Engineering Graphics”, S Chand Publications.

3) Dhananjay A Jolhe, “Engineering Drawing” Tata McGraw Hill

4) Prof. Sham Tickoo (Purdue University) & Gaurav Verma, “( CAD Soft Technologies) : Auto CAD 2012 (For engineers and Designers)”, Dreamtech Press NewDelhi.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC205 | **Structured Programming Approach** | 04 | 02 | - | 04 | 01 | - | 05 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Prat | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Av. of Test 1 & Test 2 | | | | | |
| FEC205 | **Structured Programming Approach** | 20 | 20 | 20 | 80 | 25 | 25 | - | 150 |

**Primary Objectives of this subject**

This subject aims to provide students with an understanding of the role computation can play in solving problems. The course will be taught using C programming language.

Program Education Objectives

After completing this course, students will be able to:

- Understand classical problem solving strategies and use them in solving problems that can be implemented using a programming language.
- Identify a problem that requires a programmed solution.
- Use structured approach to describe the solution concept.
- Understand concept of data types and variables using C.
- Use common operators in C to solve a problem.
- Implement conditional statements in C .
- Implement looping constructs in C.
- Implement functions in C.
- Use simple and structured data types in C to solve given problem
- Implement simple problems using files and pointers

**Detail Syllabus**

| Unit No | Unit | Number of Hours |
|---|---|---|
| 1 | **Problem definition** | 02 |
| 2 | **Algorithms** | |
| 2.1 | Developing Algorithms | 05 |
| 2.2 | Efficiency of Algorithms | 01 |
| | | |
| 3 | **Expressing Algorithm – Sequence** | |
| 3.1 | Expressions in C; Arithmetic and Boolean expressions | 03 |
| 3.2 | Use of Standard functions | 01 |
| 3.3 | Assignment statement | 01 |
| 3.4 | Input and output | 02 |
| | | |
| 4 | **Concept of scalar Data Types** | 04 |
| 4.1 | scalar data types in C , Scope and life time, type conversion | |
| | | |
| 5 | **Expressing Algorithms – Iteration** | |
| 5.1 | Ordering a solution in a loop | 02 |
| 5.2 | C- Control structures for Iteration | 06 |
| | | |
| 6 | **Expressing Algorithms – Selection** | 01 |
| 6.1 | C-Control structures for selection | 02 |
| | | |
| 7 | **Decomposition of solution** | 01 |
| 7.1 | Defining Functions in C | 02 |
| 7.2 | Functions and parameters | 02 |
| 7.3 | Introduction to recursive functions | 02 |
| | | |
| 8 | **Additional C data types** | |
| 8.1 | Arrays – single and multi dimensional | 03 |
| 8.2 | Strings | 02 |
| 8.3 | Structures | 02 |
| 8.3 | Files | 02 |
| 8.4 | Pointers | 02 |

**Books:**

**Text:**


1. programming in C ; second edition; Pradeep Day and Manas Gosh ;Oxford University Press 2011

2. C Programming with Problem solving ; Jacqueline A. Jones & Keith Harrow – Dreamtech India– Scott Jones California USA

**Reference**


1. Introduction to Engineering programming – James Paul Hollowat – John Wiley ISBN 9812-53-022-3

2. Introduction to programming and problem solving ; G. Michael Schneider ; Wiley India edition;


**Laboratory Assignments**

1. Students are expected to solve and execute at least 20 programming problems based on above syllabus.

2. Journal work should comprise of writing the problem definition, solution of problem either as Algorithm or flow chart and source code in C (preferably hand written) for all the 20 problems.

**Theory Examination**:

1. Question paper will comprise of 6 questions, each carrying 20 marks.

2. Total 4 questions need to be solved.

3: Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.

4: Remaining question will be randomly selected from all the modules.

5: Weightage of marks should be proportional to number of hours assigned to each

Module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEC206 | **Communication Skills** | 02 | 02 | - | 02 | 01 | - | 03 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | TW | Prat | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 & 2 | | | | | |
| FEC206 | **Communication Skills** | 10 | 10 | 10 | 40 | 25 | - | - | 75 |

| **S.No** | **Topic** | **No. of lectures** |
|---|---|---|
| 1. | Communication Theory: The communication process, objectives, barriers to communication, methods of communication, formal and informal channels of communication in a business organization, techniques to improve communication (Listening, speaking, reading, writing) | 12 |
| 2. | Grammar and Vocabulary: Pairs of confused words, common errors, use of articles, prepositions, apostrophes, agreement of the verb with the subject, one-word substitution, synonyms and antonyms | 3 |

| | | |
|---|---|---|
| 3. | Business Correspondence: Principles of business correspondence, parts of a business letter, formats (Full-block/Complete block, Modified block, Semi-block), types of letters: Enquiry letters and replies to enquiry (enquiry about a product, service or information, asking for a quotation, placing an order and replies to the same) letters of Claim and Adjustment. | 9 |
| 4. | Summarization and Comprehension: Technical and industry-oriented passages (not less than 400 words) | 3 |
| 5. | Technical writing : Framing definitions, writing instructions, language exercises based on types of expositions (description of an object, explanation of a process) | 3 |

Note: Two tests are prescribed for internal assessment. The first test should be conducted in the form of a three-minute public speech. The second test should be based on theory and application exercises based on the syllabus.

**Term work: 25 marks**
Assignments: 20 marks
Attendance: 05 marks

**List of assignments:**
Summarization & Comprehension
Grammar practice
Communication theory: Application exercises
Barriers to Communication
Principles of Business Correspondence
Formats of business letters
Types of letters
Technical writing

**Recommended reference books for Communication Skills:**
*Business Communication* by Urmila Rai & S.M. Rai, Himalaya Publishing House
*Communication Skills* by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
*Business Correspondence & Report-writing* by R.C.Sharma & Krishna Mohan, Tata McGraw-Hill Education
*Effective Technical Communication* by Ashraf Rizvi, Tata McGraw-Hill
*Technical Writing & Professional Communication for non-native speakers of English* by Thomas N.Huckin & Leslie A.Olsen, McGraw-Hill
*Mastering Communication* by Nicky Stanton, Palgrave Master Series

**Paper pattern**
Total Marks: 40, Duration : 2 hours
Distribution of marks and weightage:
The paper will comprise 6 questions of 10 marks each out of which 4 need to be attempted.
The first question is compulsory and will be a combination of all modules.
Students can attempt any 3 out of the remaining 5 questions.
The first module (Communication theory) will carry 40 % weightage.
Questions 2, 3, 4, 5 and 6 will be based on combinations of two or more modules.

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| FEL201 | **Basic Workshop Practice-II** | - | 04 | - | - | 02 | - | 02 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | Term Work | Pract. | Oral | Total |
| | | Internal Assessment | | | End sem. exam | | | | |
| | | Test 1 | Test 2 | Average of Test 1 & Test 2 | | | | | |
| FEL201 | **Basic Workshop Practice-II** | - | - | - | - | 50 | - | - | 50 |

**<u>Detailed Syllabus is given in Basic Workshop Practice-I</u>**

**Term work:**

Term work shall consist of respective reports and jobs of the trades selected the distribution of marks for term work shall be as follows:

Laboratory work (Job and Journal) : 40 marks

Attendance (Practical and Theory) : 10 marks

The final certification and acceptance of term – work ensures the satisfactory performance of laboratory work.

# UNIVERSITY OF MUMBAI

## Bachelor of Engineering

**Information Technology (Second Year – Sem. III & IV)**

**Revised course (REV- 2012)**

**From Academic Year 2013 -14**

**Under**

## FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

## From Dean's Desk:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education.The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) and give freedom to affiliated Institutes to add few (PEO's) and course objectives and course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of engineering education.

Semester based Credit and Grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance.Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 12-13 weeks and remaining 3-2 weeks to be utilized for revision, guest lectures, coverage of content beyond syllabus etc.

Credit and grading based system was implemented for First Year of Engineering from the academic year 2012-2013. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2013-2014, for Third Year and Final Year Engineering in the academic years 2014-2015 and 2015-2016 respectively.

**Dr. S. K. Ukarande**
**Dean,**
**Faculty of Technology,**
**Member - Management Council, Senate, Academic Council**
**University of Mumbai, Mumbai**

## Preamble

The engineering education in India in general is expanding in manifolds. Now, the challenge is to ensure its quality to the stakeholders along with the expansion. To meet this challenge, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education and reflects the fact that in achieving recognition, the institution or program of study is committed and open to external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited. Program outcomes are essentially a range of skills and knowledge that a student will have at the time of graduation from the program. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

I, as Chairman, Board of Studies in Information Technology of University of Mumbai, happy to state here that, Program Educational Objectives were finalized in a meeting where more than 30 members from different Institutes were attended, who were either Heads or their representatives of Information Technology Department. The Program Educational Objectives finalized for undergraduate program in Information Technology are listed below;

1. To prepare Learner's with a sound foundation in the basics of engineering fundamentals.
2. To prepare Learner's to use effectively modern programming tools to solve real life problems.
3. To prepare Learner's for successful career in Indian and Multinational Organisations and to excel in Postgraduate studies
4. To encourage and motivate Learner's for entrepreneurship.
5. To inculcate professional and ethical attitude, good leadership qualities and commitment to social responsibilities in Learners.
6. To encourage Learner to use best practices and implement technologies to enhance information security and enable compliance, ensuring confidentiality, information integrity, and availability.

In addition to Program Educational Objectives, for each course of undergraduate program, objectives and expected outcomes from learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

**Dr. J. W. Bakal**
**Chairman, Board of Studies in Information Technology,**
**University of Mumbai, Mumbai**

# S. E. (Information Technology) Sem.-III

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut | Theory | TW/Pract | Tut | Total |
| SEITC301 | Applied Mathematics – III * | 4 | | 1 | 4 | | 1 | 5 |
| SEITC302 | Data Structure and Algorithm Analysis | 4 | | | 4 | | | 5 |
| SEITC303 | Object Oriented Programming Methodology* | 4 | | | 4 | | | 5 |
| SEITC304 | Analog and Digital Circuits | 4 | | | 4 | | | 5 |
| SEITC305 | Database Management Systems | 3 | | | 3 | | | 4 |
| SEITC306 | Principles of Analog and Digital Communication. | 3 | | | 3 | | | 4 |
| SEITL302 | Data Structure and Algorithm Analysis | | 2 | | | 1 | | |
| SEITL303 | Object Oriented Programming Methodology* | | 2 | | | 1 | | |
| SEITL304 | Analog and Digital Circuits | | 2 | | | 1 | | |
| SEITL305 | Database Management Systems | | 2 | | | 1 | | |
| SEITL306 | Principles of Analog and Digital Communication | | 2 | | | 1 | | |
| | TOTAL | 22 | 10 | 1 | 22 | 5 | 1 | 28 |

**Examination Scheme**

| Course Code | Course Name | Theory | | | | | Term work | Pract /Oral . | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Internal Assessment | | | End sem exam | Exam duration (in Hrs) | | | |
| | | TEST1 | TEST 2 | AVG. | | | | | |
| SEITC301 | Applied Mathematics-III* | 20 | 20 | 20 | 80 | 3 | 25 | -- | 125 |
| SEITC302 | Data Structure & Algorithm Analysis | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC303 | Object Oriented Programming Methodology* | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC304 | Analog & Digital Circuits | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC305 | Database Management Systems | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC306 | Principles of Analog & Digital Communication. | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| | Total | 120 | 120 | 120 | 480 | | 150 | 125 | 875 |

*** Common with Computer Engineering.**

**Tutorials will be conducted class wise and will be evaluated as term work.**

# S. E. (Information Technology) Sem.-IV

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Th | Pract | Tut | Th. | Pract/ | Tut | Total |
| SEITC401 | Applied Mathematics-IV* | 4 | | 1 | 4 | | 1 | 5 |
| SEITC402 | Computer Networks | 4 | | | 4 | | | 5 |
| SEITC403 | Computer Organization and Architecture | 3 | | 1 | 3 | | 1 | 4 |
| SEITC404 | Automata Theory | 3 | | 1 | 3 | | 1 | 4 |
| SEITC405 | Web Programming | 4 | | | 4 | | | 5 |
| SEITC406 | Information Theory and Coding | 4 | | 1 | 4 | | 1 | 5 |
| SEITL402 | Computer Networks | | 2 | | | 1 | | |
| SEITL405 | Web Programming | | 2 | | | 1 | | |
| | Total | 22 | 4 | 4 | 22 | 2 | 4 | 28 |

# Examination Scheme

| Course Code | Course Name | Theory | | | | | Term work | Pract/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Internal Assessment | | | END SEM EXAM | EXAM DURATION (in Hrs) | | | |
| | | TEST1 | TEST 2 | AVG. | | | | | |
| SEITC401 | Applied Mathematics-IV* | 20 | 20 | 20 | 80 | 3 | 25 | -- | 125 |
| SEITC402 | Computer Networks | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC403 | Computer Organization and Architecture | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC404 | Automata Theory | 20 | 20 | 20 | 80 | 3 | 25 | -- | 125 |
| SEITC405 | Web Programming | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| SEITC406 | Information Theory and Coding | 20 | 20 | 20 | 80 | 3 | 25 | -- | 125 |
| | Total | 120 | 120 | 120 | 480 | | 150 | 75 | 825 |

*** Common with Computer Engineering.**

**Tutorials will be conducted class wise and will be evaluated as term work.**

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/ Practical | Tutorial | Total |
| SEITC301 | Applied Mathematics - III* | 04 | -- | 01 | 04 | - | 01 | 05 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test2 | Avg. Of Test1 and Test2 | | | | | |
| SEITC301 | Applied Mathematics -III* | 20 | 20 | 20 | 80 | 25 | - | - | 125 |

**Course Objective**

(1) Complex Variable (2) Laplace Transform (3) Fourier Series (4) Discrete Structures (5) Z-transform

These topics involve the study of analytic function and mapping of complex function, Laplace transform, Inverse Laplace transform and application of Laplace transform to solve differential equations, finding Fourier series, Sine and cosine Fourier integral and Z-transform. These topics help them to solve many engineering problems arising in course of their further studies and also while working in the practical life situations.

**Student Learning Outcomes:**

Students in this course will apply the Procedure and methods to solve technical problems.

## Details of the Syllabus:-

| Sr.No. | Topics | Hrs |
|---|---|---|
| **Module 01** | **Complex Variable & mapping**<br>1.1 Functions of a complex variable, Analytic functions, Cauchy-Riemann equations in Cartesian co-ordinates, Polar co-ordinates.<br>1.2 Harmonic functions, Analytic method and Milne Thomson methods to find f(z), Orthogonal trajectories.<br>1.3 Conformal Mapping, Linear, Bilinear transformations, Cross ratio, fixed points and standard transformation such as rotation and magnification, invertion, translation. | **(10)** |
| **Module 02** | **Laplace Transform**<br>2.1 Introduction, Definition of Laplace transform, Laplace transform of constant, trigonometrical, exponential functions.<br>2.2 Important properties of Laplace transform: First shifting theorem, Laplace transform of L{$t^n$ f(t)}, L{ f(t)/t},<br>$L\left\{\frac{d^n f(t)}{dt^n}\right\}$, $L\{\int_0^t f(u)du\}$, L{f(at)} without proof.<br>2.3 Unit step function, Heavi side function, Dirac-delta function, Periodic function and their Laplace transforms, Second shifting theorem.<br>2.4 Inverse Laplace transform with Partial fraction and Convolution theorem (without proof).<br>2.5 Application to solve initial and boundary value problem involving ordinary differential equations with one dependent variable and constant coefficients. | **(10)** |
| **Module 03** | **Fourier series**<br>3.1 Dirichlet's conditions, Fourier series of periodic functions with period 2π and 2L.<br>3.2 Fourier series for even and odd functions.<br>3.3 Half range sine and cosine Fourier series, Parsevel's identities (without proof).<br>3.4Orthogonal and Ortho-normal functions, Complex form of Fourier series.<br>3.5 Fourier Integral Representation. | **(10)** |
| **Module 04** | **Vector Algebra and Calculus**<br>4.1 Vector Algebra:<br>Scalar and vector product of three and four Vectors and their | **(10)** |

| | | |
|---|---|---|
| | properties.<br><br>4.2 Vector Calculus:<br><br>Vector differential operator $\nabla$ , Gradient of a scalar point function, Diversions and Curl of Vector point function, $\nabla (uv)$,<br><br>$\nabla.(\phi \bar{u}), \nabla \times (\phi \bar{u}), \nabla \times (\bar{u} \times \bar{v})$. 4.3 Vector Integration: Line integral; conservative vector field, Green's theorem in a plane (Without proof)<br><br>4.4 Gauss-Divergence theorem & Stokes' theorem (Without proof and no problems on verification of above theorems). | |
| **Module**<br><br>**05** | **Z transform**<br><br>5.1 Z-transform of standard functions such as $Z(a^n)$, $Z(n^p)$.<br><br>5.2 Properties of Z-transform :Linearity, Change of scale, Shifting property, Multiplication of K, Initial and final value, Convolution theorem (all without proof)<br><br>5.3 Inverse Z transform: Binomial Expansion and Method of Partial fraction. | **(8)** |

**Term work:**
Term work shall consist of minimum four SCILAB practicals and six tutorials.
SCILAB practicals : 08 marks
Tutorials : 12 marks
Attendance : 05 marks
**Total : 25 marks**

**Recommended Books:**


1. Higher Engineering Mathematics by Grewal B. S. 38th edition, Khanna Publication 2005.
2. Advanced Engineering Mathematics by Kreyszig E. 9th edition, John Wiley.
3. A Text Book of Applied Mathematics Vol. I & II by P.N.Wartilar & J.N.Wartikar, Pune, Vidyarthi Griha Prakashan., Pune.
4. Vector Calculus by Shanti Narayan, S Chand & Co.


**Reference Books:**


1. Advanced Engg. Mathematics by C. Ray Wylie & Louis Barrett.TMH International Edition.
2. Mathematical Methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
3. Lapplace Treansforms by Murray R. Spiegel, Schaun's out line series-McGraw Hill Publication.
4. Vector Analysis by Murray R. Spiegel, McGraw Hill publication.

**Theory Examination :**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tut. | Theory | TW/Pract | Tut | Total |
| SEITC302 | Data Structure and Algorithm Analysis | 04 | 02 | - | 04 | 01 | - | 05 |

| Subject code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Pract | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| SEITC302 | Data Structure and Algorithm Analysis | Test1 | Test2 | Average of Test1 and Test2 | | | | | |
| | | 20 | 20 | 20 | 80 | 25 | 25 | - | 150 |

**Objectives:**

- To teach efficient storage mechanisms of data for an easy access.
- To design and implementation of various basic and advanced data structures and algorithm analysis.
- To introduce various techniques for representation and analysis of the data in the real world.
- To develop application using data structures and algorithm and analysis.
- To teach the concept of protection and management of data.
- To improve the logical ability

**Outcomes**:

- Student will be able to choose appropriate data structure as applied to specified problem definition and analysis the algorithm.
- Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures and algorithm analysis.
- Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc.
- Students will be able to use linear and non-linear data structures like stacks, queues, linked list etc.

| Module | Detailed Contents | Hours |
|---|---|---|
| 1 | **Introduction:**<br>Introduction, Mathematics Review, Exponents, Logarithms, Series, Modular Arithmetic, The P Word, A Brief Introduction to Recursion, Recursion and Induction. | 3 |
| 2 | **Algorithm Analysis:** Mathematical Background, Model, What to Analyze, Running Time Calculations, General Rules, Solutions for the Maximum Subsequence Sum Problem, Logarithms in the Running Time, Euclid's Algorithm, Exponentiation, Checking Your Analysis, A Grain of Salt. | 4 |
| 3 | **Stacks, Queues and List**<br>Stacks, Queues, Linked Lists, Double-ended Queues. Abstract Data Type (ADT), The List ADT, Simple Array Implementation of Lists, Linked Lists, Programming Details, Common Errors, Doubly Linked Lists, Circularly Linked Lists, Examples, Cursor Implementation of Linked Lists, The Stack ADT, Implementation of Stacks, Applications, The Queue ADT, Array Implementation of Queues, Applications of Queues. | 10 |
| 4 | **Trees and Search Trees:**<br>Tree, Implementation of Trees, Tree Traversals with an Application, Binary Trees, Expression Trees, the Search Tree ADT-Binary Search Trees, AVL Trees, Single Rotation, Double Rotation, Red-Black Trees, External searching in B-Trees, Tree Traversals, B-Trees | 10 |
| 5 | **Priority queues:**<br>The priority queues Abstract data Type, Implementing a Priority queues with a List, Heaps, Adaptable priority queues. | 6 |
| 8 | **Sorting Sets, and Selection:**<br>Insertion Sort, Shellsort, Heapsort, Quicksort, Bucket Sort, Merge Sort and radix Sort, and A Lower Bound on comparison-based Sorting and radix Sort, the complexity of some sorting algorithms, comparison of Sorting Algorithms, The Set ADT and union / file Structures | 6 |
| 9 | **Graphs:**<br>The graph Abstract Data Type, Data Structures for Graphs, Graph Traversals Directed Graphs, Weighted Graphs, Shortest Paths, and Minimum spanning Trees. Applications of DFS and BSF, Shortest-Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge Costs, Acyclic Graphs, Network Flow Problems, Minimum Spanning Tree. | 9 |

**TEXT BOOKS:**


1. Mark Allien Weiss, "Data Structure and Algorithm Analysis in C", Person.
2. Micheal Goodrict, Roberto Tamassia,"Data Structure and Algorithm in C++", Wiley India

3. Data Structures A Psedocode Approach with C, Richard F. Gilberg & Behrouz A. Forouzan, second edition, CENGAGE Learning.
4. Data Structures Using C & C++, Rajesh K. Shukla, Wiley- India
5. Data Structures using C, Reema Thareja, Oxford University press.
6. Introduction to Data Structure and its Applications Jean-Paul Tremblay, P. G. Sorenson

**REFERENCE BOOKS:**

1. Ellis horowitz, Sarataj Sahni, S.Rajsekaran," Fundamentals of computer algorithm", University Press .
2. Mark Allen Weiss,"Data Structure & algorithm Analysis in C++", 3rd Edition, Pearson Education
3. Micheal Goodrict, Roberto Tamassia,"Data Structure and Algorithm in C++", Wiley India.
4. Data Structures Using C, ISRD Group, Second Edition, Tata McGraw-Hill
5. Data Structure Using C, Balagurusamy
6. C & Data Structures, Prof. P.S. Deshpande, Prof. O.G. Kakde, Dreamtech press.
7. Data Structures, Adapted by: GAV PAI, Schaum's Outlines
8. Mark Allen Weiss,"Data Structure & algorithm Analysis in C++", 3rd Edition, Pearson Education

**Term Work:**

Term Work shall consist of at least 12 programs based on the below list.
**Note**: The star (*) marks experiments are mandatory.

| **Linked List** |
|---|
| 1. Implementations of Linked Lists menu driven program.<br>2. * Implementation of different operations on linked list – copy, concatenate, split, reverse, count no. of nodes etc<br>3. Representation of Sparse matrix using multilinked structure. Implementation of sparse matrix multiplication.<br>4. Implementation of polynomials operations (addition, subtraction) using Linked List.<br>5. *Implementations of Linked Lists menu driven program (stack and queue)<br>6. Implementations of Double ended queue using Linked Lists.<br>7. Implementation of Priority queue program using Linked List. |
| **Stack** |
| 1. Implementations of stack menu driven program<br>2. Implementation of multistack in one array.<br>3. * Implementations of Infix to Postfix Transformation and its evaluation program.<br>4. Implementations of Infix to Prefix Transformation and its evaluation program.<br>5. Simulation of recursion |
| **Queue** |

| |
|---|
| 1. Implementations of circular queue menu driven program<br>2. * Implementations of double ended queue menu driven program<br>3. Implementations of queue menu driven program<br>4. Implementation of Priority queue program using array.<br>5. Implementation of Johnsons Algorithm<br>6. Implementation of Simulation Problem |
| **Tree** |
| 1. *Implementations of Binary Tree menu driven program<br>2. Implementation of Binary Tree Traversal program.<br>3. *Implementation of construction of expression tree using postfix expression.<br>4. Implementations of Huffman code construction<br>5. Implementations of BST program<br>6. Implementation of various operations on tree like – copying tree, mirroring a tree, counting the number of nodes in the tree, counting only leaf nodes in the tree.<br>7. Implementations of B-tree menu driven program<br>8. Implementations of B+ tree program<br>9. Implementation of Preorder traversal of a threaded binary tree.<br>**10.** *Implementations of AVL Tree menu driven program |
| **Sorting** |
| 1. Implementations of Shell sort, Radix sort and Insertion sort menu driven program<br>**2.** *Implementations of Quick Sort, Merge sort and Heap Sort menu driven program |
| **Searching** |
| 1. Implementations of searching methods (Index Sequential, Interpolation Search) menu driven program<br>**2.** Implementation of hashing functions with different collision resolution techniques |
| **Graph** |
| 1. * Implementations of Graph menu driven program |

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tut. | Theory | TW/Pract | Tut | Total |
| SEITC303 | Object Oriented Programming Methodology * | 04 | 02 | - | 04 | 01 | - | 05 |

| Subject code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Pract | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| SEITC303 | Object Oriented Programming Methodology* | Test1 | Test2 | Average of Test1 and Test2 | | | | | |
| | | 20 | 20 | 20 | 80 | 25 | 25 | - | 150 |

## Course Objectives

- To understand Object oriented concepts like data abstraction, encapsulation, etc.
- To solve the real world scenarios using top down approach.
- To understand various Java programming constructs.

## Course Outcomes

- Students will be able to solve computational problems using basic constructs like if-else, control structures, array, strings.
- Student can understand how to model real world scenario using class diagram.
- Students will exhibit communication between 2 objects using sequence diagram.
- Students will be able to implement relationships between classes.
- Students will be able to demonstrate various collection classes.
- The students will be able to demonstrate programs on exceptions, multithreading and applets.

## Detailed Syllabus:

| Sr. No. | Topic | No of Hours |
|---|---|---|
| 1 | Programming Approach from proceduaral to Object Orientation OO methodologies: Grady Booch Methodology of OO development | 4 |
| 2 | OO Concepts: Object, Class, Encapsulation or information hiding, Inheritance, Polymorphism, Message communication, Abstraction, Reuse, Coupling and Cohesion, Sufficiency Completeness and Primitiveness, Meta class | 5 |
| 3 | Object Oriented Programming: Java Evolution: History, How java differs from others Overview of Java language: Introduction, Installing and implementing Java, JVM | 3 |
| 4 | Constants, variables and data types Operators and Expressions Revision of Branching and looping | 6 |
| 5 | Class Object and Method: member, method, Modifier, Selector, constructer, destructor, iterator, State of an object, Method Overloading, Inheritance, Method Overriding ,Final class, abstract class and method | 6 |
| 6 | Classes and Relationships : Implementation of Association and Aggegation using simple scenarios | 2 |
| 7 | Array, String, Vector | 6 |
| 8 | Interfaces : variables in Interfaces, Extending an Interface, Difference between an Abstarct class and an Interface | 4 |
| 9 | Multithread programming | 4 |
| 10 | Grouping of classes for deployment and reuse: Built-in Packages: java.lang: wrapper classes java.util: ArrayList and LinkedList Creating and using User defined packages | 3 |
| 11 | Managing Error and Exception | 3 |
| 12 | Applet programming | 2 |

## Text Books:


1. Ralph Bravaco , Shai Simoson , “Java Programing From the Group Up” ,Tata McGrawHill
2. Grady Booch, Object Oriented Analysis and Design ;

3. Jaime Nino, Frederick A. Hosch, 'An introduction to Programming and Object Oriented
Design using Java', Wiley Student Edition.

## Reference Books:

1. Java: How to Program, 8/e, Dietal, Dietal, PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language ser Guide", Pearson Education
3. Sachin Malhotra, Saurabh Chaudhary "Programming in Java", Oxford University Press, 2010

## Suggested list of Programming Assignments /Laboratory Work

Divide laboratory work into 3 parts

Part - A

Basic Java structural components and Conditional and control statements:

· To demonstrate the use of command line argument.
· To demonstrate various ways of accepting data through keyboard.
· To understand the working of an array.
· To understand string class and demonstrate its various functions.

### Part - B

Perform following practical on some case study like Banking Application, Library Application etc.

· Find out classes, objects and their properties.
· Create and display objects found in above.
· Add methods to classes and implement.
· Refine above objects by adding constructors and local variables.
· Show communication between the objects by calling instance of one object from another
class.
· Find relationships like inheritance, association, aggregation, composition.
· Implement above relationships.

### Part - C

1. To implement user defined exceptions in Java.
2. Demonstrate the use collection classes like ArrayList/LinkedList/HashSet/TreeSet/Map.
3. To illustrate Multithreading in Java.
4. Simple programs on Applets and AWT.

TermWork:

Students will submit Term Work in the form of a journal that will include at least 15 programming assignments. Each programming assignment will consist of an algorithm or class diagram/sequence diagram (if applicable), program listing with proper documentation and snapshot of the output.

Practical Examination will be based on the term work and questions will be asked to judge understanding of the assignments at the time of the examination.

Term Work: 25 Marks ( total marks ) = 15 Marks ( Experiment ) + 5 Marks
(Assignment) + 5 (Attendance (theory + practical))

**Theory `Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tut. | Theory | TW/Pract | Tut | Total |
| SEITC304 | Analog and Digital Circuits | 04 | 02 | - | 04 | 01 | - | 05 |

| Subject code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Pract | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| SEITC304 | Analog and Digital Circuits | Test1 | Test2 | Average of Test1 and Test2 | | | | | |
| | | 20 | 20 | 20 | 80 | 25 | -- | 25 | 150 |

**Course Objective:**

1) To provide concepts that underpins the disciplines of Analog circuits, digital electronics and Microprocessor systems.
2) To provide the concept of various components
3) To provide basic knowledge of designing Analog and digital circuits

**Course outcomes:**

1) Knowledge and Awareness of various components.
2) Design of stable analog circuits.
3) Circuit simulation.
4) Binary and hexadecimal calculations and conversions.
5) Design of combinational and sequential circuits.
6) Translate real world problems into digital logic formulations.
7) Awareness in Design of digital systems and concepts of Microprocessor and Microcontroller systems.

## Detailed Syllabus:

| Module | Detailed Contents | Hours |
|---|---|---|
| 1 | Voltage Regulator and components: Zener diode. Series and Shunt Regulator. Regulator ICs 78XX, IC 79XX.Light Emitting diode(LED), Schottky diode, Varactor diode, power diode, Photodiodes, Liquid-crystal Displays, Solar cells, Thermistor. | 06 |
| 2 | Biasing of BJT: DC operating point, BJT characteristics & parameters, | 08 |

| | | |
|---|---|---|
| | all biasing circuits, analysis of above circuits and their design, variation of operation point and its stability. Differential Amplifier, constant current source, current mirror. Introduction to FET and comparison with BJT. | |
| 3 | Operational Amplifiers and linear applications: Block diagram representation, Ideal Op-amp, Equivalent circuit, Open-loop configuration, Transfer characteristics. Op-amp with negative feedback, Frequency response. Op-amp IC 741 specifications. Basic op-amp applications: Adder, Scalar, Subtractor, Difference amplifier, I-V converter, V-I converters, Integrator, Differentiator, Instrumentation amplifier using 2 and 3 op-amp stages. IC 555 Timer, Astable, and Monostable Multivibrator. | 10 |
| 4 | Number Systems and Codes: Binary, Octal, Decimal and Hexadecimal number Systems and their conversion, Binary Addition and Subtraction , Gray Code, BCD Code, Excess-3 code, ASCII Code. | 04 |
| 5 | Boolean Algebra and Logic Gates: Theorems and Properties of Boolean Algebra, Standard SOP and POS form, Reduction of Boolean functions using Algebric method, K -map method (2,3,4 Variable).<br>Basic Digital Circuits: NOT,AND,OR,NAND,NOR,EX-OR,EX-NOR Gates. | 04 |
| 6 | Combinational Logic Design: Introduction, Half and Full Adder, Half and Full Subtractor, Four Bit Binary Adder, One digit BCD Adder, code conversion, Multiplexers and Demultiplexers, Decoders, 4-bit Magnitude Comparator IC 7485 and ALU IC74181. | 06 |
| 7 | Sequential Logic Design: Flip Flops: SR, D, JK, JK Master Slave and T Flip Flop, Truth Tables and Excitation Tables, Flip-flop conversion.<br>Counters: Design of Asynchronous and Synchronous Counters, Modulo Counters, UP- DOWN counter .IC 74193<br>Shift Registers: Shift Register IC 7496 , SISO, SIPO,PIPO,PISO, Bidirectional Shift Register , Universal Shift Register, Ring and Johnson Counter. | 06 |
| 8 | Introduction to VHDL: Introduction , Library, Entity, Architecture, Modeling Styles, Concurrent and sequential statements, Data objects and Data types, attributes. Design Examples for combinational circuits. | 04 |

**TERMWORK MARKS:** 1. Attendance (Theory and Practical) - 05
2. Laboratory work (Experiments and Journal) -15
3. Assignments -05

The final certification and acceptance of TW ensures the satisfactory performance of Laboratory Work and Minimum Passing in the term work.

**LABORTARY WORK:**

1. Laboratory work should consist of at least 10 Experiments.

The Experiments should be based on following topics (Any Ten):

1) Zener diode as Regulator.
2) BJT Biasing Method.
3) OP-amp as Inverting and Non-inverting amplifier.
4) Applications of Op-amp.
5) IC 555 as astable Multivibrator.
6) Simulation of any circuit using Pspice.
7) Logic Gates.
8) Code Conversion.
9) Multiplexer, Demultiplexer.
10) Flip-flops using gates and ICs.
11) Design of Sequential circuits.
12) VHDL for Combinational logic.

**Text Books:**


1. Robert L. Boylestad, Louis Nashelsky, "Electronic devices and circuit Theory", PHI
2. Ramakant A. Gaikwad, "Op-amp and linear Integrated circuits", PHI
3. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill.
4. M. Morris Mano, "Digital Logic and computer Design", PHI.
5. J. Bhasker." VHDL Primer", Pearson Education


**Reference Books:**


1. Martin s. Roden, Gordon L. Carpenter, William R. Wieserman "Electronic Design-From Concept to Reality", Shroff Publishers and Distributors.
2. D.roy Choudhury,shail B.jain, "Linear integrated Circuits", New age International Publisher.
3. Subrata Ghosal, "Digital Electronics", Cengage Learning.
4. Anil K. Maini, "Digital Electronics Principles and Integrated Circuits", Wiley India
5. Donald p Leach, Albert Paul Malvino, "Digital principles and Applications", Tata McGraw Hill.

**Theory Examination :**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| SEITC305 | Database Management System | 03 | 02 | -- | 03 | 01 | -- | 04 |

| Sub. Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Pract. | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| SEITC305 | Database Management System | Test 1 | Test 2 | Avg. of Test1 & Test2 | | | | | |
| | | 20 | 20 | 20 | 80 | 25 | 25 | - | 150 |

**Objective:**

- Learn and practice data modeling using the entity-relationship and developing database designs.
- Understand the use of Structured Query Language (SQL) and learn SQL syntax.
- Apply normalization techniques to normalize the database
- Understand the needs of database processing and learn techniques for controlling the consequences of concurrent data access.

**Outcome:** The student should be able:

- To describe data models and schemas in DBMS
- To understand the features of database management systems and Relational database.
- To use SQL- the standard language of relational databases.
- To understand the functional dependencies and design of the database.
- To understand the concept of Transaction and Query processing.

## Detailed Syllabus:

| Module | Detailed content | Hours |
|---|---|---|
| 1 | **Introduction Database Concepts:** Introduction, Characteristics of databases, File system V/s Database system, Users of Database system, Concerns when using an enterprise database, Data Independence, DBMS system architecture, Database Administrator, | 02 |
| 2 | **Entity–Relationship Data Model :** Introduction, Benefits of Data Modeling, Types of Models, Phases of Database Modeling, The Entity-Relationship (ER) Model, Generalization, Specialization and Aggregation, Extended Entity-Relationship (EER) Model. | 03 |
| 3 | **Relational Model and Algebra :** Introduction , Mapping the ER and EER Model to the Relational Model , Data Manipulation , Data Integrity ,Advantages of the | 06 |

| | | |
|---|---|---|
| | Relational Model, Relational Algebra , Relational Algebra Queries, Relational Calculus. | |
| 4 | **Structured Query Language (SQL) :** Overview of SQL , Data Definition Commands, Set operations , aggregate function , null values, , Data Manipulation commands, Data Control commands , Views in SQL, Nested and complex queries . | 06 |
| 5 | **Integrity and Security in Database:** Domain Constraints, Referential integrity, Assertions, Trigger, Security, and authorization in SQL | 04 |
| 6 | **Relational–Database Design :** Design guidelines for relational schema, Function dependencies, Normal Forms- 1NF, 2 NF, 3NF, BCNF and 4NF | 04 |
| 7 | **Transactions Management and Concurrency:** Transaction concept, Transaction states, ACID properties, Implementation of atomicity and durability, Concurrent Executions, Serializability, Recoverability, Implementation of isolation, Concurrency Control: Lock-based , Timestamp-based , Validation-based protocols, Deadlock handling, Recovery System: Failure Classification, Storage structure, Recovery & atomicity, Log based recovery, Shadow paging. | 06 |
| 8 | **Query Processing and Optimization: Overview** ,Issues in Query Optimization ,Steps in Query Processing , System Catalog or Metadata, Query Parsing , Query Optimization, Access Paths , Query Code Generation , Query Execution , Algorithms for Computing Selection and Projection , Algorithms for Computing a Join , Computing Aggregation Functions , Cost Based Query Optimization . | 05 |

## Text Books:


1. G. K. Gupta :"Database Management Systems", McGraw – Hill.
2. Korth, Slberchatz,Sudarshan, :"Database System Concepts", 6th Edition, McGraw – Hill
3. Elmasri and Navathe, " Fundamentals of Database Systems", 5thEdition, PEARSON Education.
4. Peter Rob and Carlos Coronel, " Database Systems Design, Implementation and Management", Thomson Learning, 5th Edition.


## Reference Books :


1. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle 10g,Black Book, Dreamtech Press
2. Mark L. Gillenson, Paulraj Ponniah, " Introduction to Database Management",Wiley
3. Sharaman Shah ,"Oracle for Professional", SPD.
4. Raghu Ramkrishnan and Johannes Gehrke, " Database Management Systems",TMH
5.Debabrata Sahoo "Database Management Systems" Tata McGraw Hill, Schaum's Outline

**Term Work:**

Assign a case study for group of 2/3 students and each group to perform on their case study following experiments-

1) Problem Definition and draw ER /EER diagram
2) Design Relational Model
3) Perform DDL operation
4) PL/SQL
5) Perform DML and DCL operations
6) Executes- Assertions, Trigger,
7) Implementation ACID properties
8) Draw Query tree
9) Estimate cost of query

**Laboratory Syllabus:**

1) Problem Definition and draw ER /EER diagram
2) Design Relational Model
3) Perform DDL operation
4) PL/SQL
5) Perform DML and DCL operations
6) Executes- Assertions, Trigger,
7) Implementation ACID properties
8) Draw Query tree
9) Estimate cost of query

**Tools used:**

Oracle, DB2, MY SQL or any other open source tools.

**Theory Examination :**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/ Practical | Tutorial | Total |
| **SEITC306** | Principles of Analog and Digital Communication | 03 | 02 | -- | 03 | 01 | -- | 04 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| **SEITC306** | Principles of Analog and Digital Communication | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Prerequisite**

Basic knowledge of electrical engineering concepts and analog and digital electronics.

**Course Objective**

To introduce the basic principles and techniques used in analog and digital communications, involving analog and digital modulation techniques, communication receiver and transmitter design, baseband and bandpass communication techniques, line coding techniques, noise analysis and multiplexing techniques.

**Course Outcome**

The student can analyse analog communication systems, can understand differences between analog and digital representation and transmission of information, trade-offs (in terms of bandwidth, power, and complexity requirements) between basic analog and digital communication systems and can design basic analog or digital communication systems to solve a given communications problem.

## Detailed Syllabus:

| Module | Topics | Hours |
|---|---|---|
| 1 | **Introduction**<br>Basics of analog communication systems (Block diagram), Sources of information, Baseband and bandpass signals, Types of communication channels, Frequency / Spectrum allocations, Need for modulation and demodulation | 03 |
| 2 | **Fourier Transform and Noise**<br>Introduction to Fourier Transform, its properties, Fourier transform of unit step, delta and gate function. Correlated and uncorrelated sources of noise in communication system, Noise parameters – Signal to noise ratio, Noise factor, Noise figure, Friis formula and Equivalent noise temperature | 04 |
| 3 | **Analog Modulation and Demodulation**<br>Amplitude modulation techniques and its types- DSBFC AM, DSBSC-AM, SSB SC AM- spectrum, waveforms, bandwidth, power calculations. AM Receivers – Block diagram of TRF receivers and Super heterodyne receiver. Receiver characteristics - Sensitivity, Selectivity, Fidelity, Image frequency and its rejection and double spotting<br>**FM transmission and reception**:<br>Principle of FM- waveforms, spectrum, bandwidth. Pre- emphasis and de-emphasis in FM, FM noise triangle,Comparison of AM and FM systems, FM generation: Direct method – Varactor diode modulator, Indirect method (Armstrong method)<br>FM demodulator: Foster Seely discriminator, Ratio detector. | 11 |

| | | |
|---|---|---|
| 4 | **Pulse Analog Modulation**<br>Sampling theorem for low pass and bandpass signals with proof, anti aliasing filter, PAM, PWM and PPM generation and degeneration. | 04 |
| 5 | **Digital Modulation Techniques**<br>Introduction to digital communication (Block diagram), Quantization process, Pulse code modulation, Delta modulation, Adaptive delta modulation, Principle of time division multiplexing, Frequency division multiplexing and its applications | 04 |
| 6 | **Bandpass Modulation**<br>Introduction to Line codes, Intersymbol interference, Binary phase shift keying, Differentally encoded phase shift keying, Quadrature phase shift keying, M-ary phase shift keying, Quadrature amplitude shift keying, Binary frequency shift keying, M-ary frequency shift keying, Minimum shift keying. (Block diagram, spectrum and bandwidth calculation and applications in each case) | 10 |
| | Total | (12 x 3)=<br>**36 hours** |

**Internal Assessment (IA):**

Two tests must be conducted which should cover at least 80% of the syllabus. The average marks of both the tests will be considered as final IA marks.

**Recommended Books**

**Text Books**


[1] Simon Haykin, Michael Moher, Introduction to Analog & Digital Communications, Wiley India Pvt. Ltd., 2nd Ed.

[2] Herbert Taub, Donald L Schilling, Goutam Saha, Principles of Communication Systems, Tata McGraw Hill, 3rdEd.

[3] V Chandrasekar, Communication Systems, Oxford University Press, Ist Ed.

**Reference Books**

George Kennedy, Bernard Davis, SRM Prasanna, Electronic Communication Systems, Tata McGraw Hill, 5th Ed.

[1] Wayne Tomasi, Electronic Communications Systems, Pearson Publication, 5th Ed.

[2] BP Lathi,Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University Press, 4th Ed.

[4] K Sam Shanmugam, Digital and Analog Communication Systems, Wiley India Pvt. Ltd, 1st Ed.

**Suggested Topics of Experiments**

1. Amplitude modulation - generation and detection
2. Frequency modulation generation and detection
3. Study of AM/ FM receiver
4. Signal sampling and reconstruction
5 PWM generation
6. PCM coding and decoding
7. Delta modulation and demodulation
8. TDM/ FDM
9. BPSK
10. BFSK
11. BASK
12. QPSK
13. Study of eye pattern

**Term Work:**

Term work shall consist of at least 08 experiments from the suggested topics. 04 experiments out of these have to be performed on hardware and 04 can be performed using suitable simulation software.

Distribution of marks for term work shall be asfollows:
1. Attendance (Theory and Practical): 05 Marks
2. Laboratory work (Experiments and Journal): 10 Marks
3. Assignments: 10 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each mo

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tutorial | Theory | TW/ Pract. | Tutorial | Total |
| SEITC401 | Applied Mathematics - IV * | 04 | -- | 01 | 04 | - | 01 | 05 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test2 | Avg. | | | | | |
| SEITC401 | Applied Mathematics –IV* | 20 | 20 | 20 | 80 | 25 | - | - | 125 |

**Course Objective:**

This course will present matrix theory, Similar matrices and it's application to find the matrics function. Present methods of computing and using eigen values and eigen vectors. Set up and directly evaluate contour integrals Cauchys integral theorem and formula in basic and extended form. Present Taylor and Laurents series to find singularities zero's and poles also presents residues theory and it's applications. Present theory of probability, Baye's Theorem, Expectation and Moments and it's application. Present probability distribution such as binomial, Poisson and normal distribution with their properties. Present sampling theory and it's application for small and large sample. Present methods of computing optimization using simplex method.

**Student Learning Outcomes:**

Students in this course will apply the method of solving complex integration and computing residues. Use residues to evaluate various contour integrals. Demonstrate ability to manipulate matrices and compute eigen values and eigenvectors.

Students in this course will apply the Procedure and methods to solve technical problems.

## Detailed Syllabus:

| Sr.No. | Details | Hrs |
|---|---|---|
| **Module 01** | **Complex Integration**<br>1.1 Complex Integration – Line Integral, Cauchy's Integral theorem for simply connected regions, Cauchy's Integral formula(without proof)<br>1.2 Taylor's and Laurent's series ( without proof)<br>1.3 Zeros, poles of f(z), Residues, Cauchy's Residue theorem<br>1.4 Applications of Residue theorem to evaluate Integrals of the type<br>$\int_0^{2\Pi} f(\sin\theta,\cos\theta)d\theta, \int_{-\infty}^{\infty} f(x)dx$. | **(10)** |
| **Module 02** | **Matrices:-**<br>2.1 Eigen values and eigen vectors<br>2.2 Cayley-Hamilton theorem(without proof)<br>2.3 Similar matrices, diagonalisable of matrix.<br>2.4 Derogatory and non-derogatory matrices ,functions of square matrix. | **(08)** |
| **Module 03** | **Correlation**<br>3.1Scattered diagrams, Karl Pearson's coefficient of correlation, covariance, Spearman's Rank correlation.<br>3.2 Regression Lines. | **(04)** |
| **Module 04** | **Probability**<br>4.1 Baye's Theorem,<br>4.2 Random Variables:- discrete & continuous random variables, expectation, Variance, Probability Density Function & Cumulative Density Function.<br>4.3 Moments, Moment Generating Function.<br>4.4 Probability distribution: binomial distribution, Poisson & normal distribution. (For detail study) | **(08)** |
| **Module 05** | **Sampling theory**<br>5.1 Test of Hypothesis, Level of significance, Critical region, One Tailed and two Tailed test, Test of significant for Large Samples:-Means of the samples and test of significant of means of two large samples.<br>5.2 Test of significant of small samples:- Students t- distribution for dependent and independent samples.<br>5.3 Chi square test:- Test of goodness of fit and independence of attributes, Contingency table. | **(08)** |
| **Module 06** | **Mathematical Programming**<br>6.1 Types of solution, Standard and Canonical form of LPP, Basic and feasible solutions, simplex method.<br>6.2 Artificial variables, Big –M method (method of penalty).<br>6.3 Duality, Dual simplex method.<br>6.4 Non Linear Programming:-Problems with equality constrains and inequality constrains<br>(No formulation, No Graphical method). | **(10)** |

**Term work:**
Term work shall consist of minimum four SCILAB practicals and six tutorials.
SCILAB practicals : 08 marks
Tutorials : 12 marks
Attendance : 05 marks
**Total : 25 marks**

**Recommended Books:**

1. Higher Engineering Mathematics by Grewal B. S. 38th edition, Khanna Publication 2005.
2. Operation Research by Hira & Gupta,S Chand.
3. A Text Book of Applied Mathematics Vol. I & II by P.N.Wartilar & J.N.Wartikar, Pune, Vidyarthi Griha Prakashan., Pune.
4. Probability and Statistics for Engineering, Dr. J Ravichandran, Wiley-India.
5. Mathematical Statistics by H. C Saxena, S Chand & Co.

**Reference Books:**

1. Advanced Engg. Mathematics by C. Ray Wylie & Louis Barrett.TMH International Edition.
2. Mathematical Methods of Science and Engineering by Kanti B. Datta, Cengage Learning.
3. Advanced Engineering Mathematics by Kreyszig E. 9th edition, John Wiley.
4. Operations Research by S.D. Sharma Kedar Nath, Ram Nath & Co. Meerat.
5. Engineering optimization (Theory and Practice) by Singiresu S.Rao, New Age International publication.
6. Probability by Seymour Lipschutz, McGraw-Hill publication.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tutorial | Theory | TW/ Pract. | Tutorial | Total |
| SEITC402 | Computer Networks | 04 | 02 | -- | 04 | 01 | -- | 05 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Pract. | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test2 | Avg. of 2 Tests | | | | | |
| SEITC402 | Computer Networks | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

- To be familiar with the basics of data communication.
- To be familiar with the basics of Computer networks and working of Internet.
- To be familiar with various types of computer networks.
- To have experience in designing communication protocols.
- To be exposed to the TCP/IP protocol suite.
- To understand the working of Packet Switched network (PSN).
- To be familiar with Windows and UNIX networking style.

**Course Outcomes:**

1. Ability to understand principles of LAN design such as topology and configuration depending on types of users accessing the network.
2. Ability to understand design performance issues like different type of network interfaces network components and choosing appropriate network type and media.
3. Ability to understand network industry standards such as: the OSI & TCP models, Routing Protocols, Address Resolution and Reverse Address Resolution Protocols, IP Addressing and Subnetting, MAC Addressing.
4. Ability to work with network tools.
5. Ability to understand the working of network operating system.

## Detailed Syllabus:

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **Introduction** | Network Applications, Network Hardware, Network Software, Reference Models. | **04** |
| 2 | **The Physical Layer** | Guided Transmission Media, Wireless Transmission, Communication Satellites, The Public Switched Telephone Network, The Mobile Telephone System, Cable Television. | **06** |
| 3 | **The Data Dink Layer** | Data Link Layer Design Issues, Error Detection and correction, Elementary Data Link Protocols, Sliding Window Protocols, Example Data Link Protocols: HDLC: High-Level Data Link Control, The Data Link Layer In The Internet. | **08** |
| 4 | **The Medium Access Sub-layer** | The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Data Link Layer Switching. | **06** |
| **5** | **The Network Layer** | Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality Of Service, Internetworking, The Network Layer In The Internet: The IP Protocol, IPv4 header, IP Addressesing, Subnetting, Internet Control Protocols, The Interior Gateway Routing Protocol: OSPF, The Exterior Gateway Routing Protocol: BGP. | **10** |
| **6** | **The Transport Layer** | The Transport Service, Elements Of Transport Protocols,The Internet Transport Protocol: UDP, The Internet Transport protocol: TCP: -Introduction To TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management, Transactional TCP. | **10** |
| **7** | **Case study** | Networking using Windows and Linux Operating systems. | **04** |

**Text Books:**

1. A. S. Tanenbaum,"Computer Networks", 4th edition, Prentice Hall

2. B. F. Ferouzan,"Data and Computer Communication", Tata McGraw Hill.

**References:**


1. Peterson & Davie, "Computer Networks", 2nd Edition, Morgan Kaufmann.
2. Kurose, Ross, "Computer Networking", Addison Wesley
3. S. Keshav, "An Engg, Approach To Computer Networking", Addison Wesley.
4. W. Richard Stevens, "TCP/IP Volume1, 2, 3", Addison Wesley.
5. D. E. Comer, "Computer Networks And Internets", Prentice Hall.
6. B. F. Ferouzan , "TCP/IP Protocol Suit", Tata McGraw Hill.


**Term work**

Students are expected to perform 8 programming assignments two case study assignments.

**Suggested Practical List**

- Network OS installation and configuration.
- Understanding various networking commands like ARP, RARP, ping, tracert, telnet, nslookup.
- Installation and Understanding of Ns-2 simulator.
- Emulation of Sliding window protocol and other data link layer protocols using NS-2.
- Implementation of Routing Algorithms using NS-2.
- Implementation of shortest path algorithms.
- Case Study: Networking using Windows and Linux Operating systems.

## Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject Code | Subject Name | Teaching Scheme | | | Credit Assigned | | |
|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW | Total |
| SEITC403 | Computer Organization and Architecture | 03 | - | 01 | 03 | 01 | 04 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Pract | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| | | Test1(T1) | Test2(T2) | Average of T1 & T2 | | | | | |
| SEITC403 | Computer Organization and Architecture | 20 | 20 | 20 | 80 | 25 | - | 25 | 150 |

**Pre-requistes: Fundamentals of Computer, Digital Logic Circuits, Programming Languages (C, C++, Java)**

**Course Educational Objectives (CEO):**

| | |
|---|---|
| **CEO 1** | To conceptualize the basics of organizational and architectural issues of a digital computer. |
| **CEO 2** | To analyze performance issues in processor and memory design of a digital computer. |
| **CEO 3** | To understand various data transfer techniques in digital computer. |
| **CEO 4** | To analyze processor performance improvement using instruction level parallelism |

**Course Learning Outcomes:**

| | |
|---|---|
| **A** | Ability to understand basic structure of computer. |
| **B** | Ability to perform computer arithmetic operations. |
| **C** | Ability to understand control unit operations. |
| **D** | Ability to design memory organization that uses banks for different word size operations. |
| **E** | Ability to understand the concept of cache mapping techniques. |
| **F** | Ability to understand the concept of I/O organization. |
| **G** | Ability to conceptualize instruction level parallelism. |

**Detail Syllabus:**

| Module | Detailed Contents | Hours |
|---|---|---|
| 1 | **Overview of Computer Architecture & Organization:**<br>Introduction of Computer Organization and Architecture. Basic organization of computer and block level description of the functional units. Evolution of Computers, Von Neumann model. Performance measure of Computer Architecture. Introduction to buses and connecting I/O devices to CPU and Memory, bus structure. | **04** |
| 2 | **Data Representation and Arithmetic Algorithms:**<br>Number representation: Binary Data representation, two's complement representation and Floating-point representation. IEEE 754 floating point number representation. Integer Data computation: Addition, Subtraction. Multiplication: Signed multiplication, Booth's algorithm.<br>Division of integers: Restoring and non-restoring division<br>Floating point arithmetic: Addition, subtraction | **10** |
| 3 | **Processor Organization and Architecture:**<br>CPU Architecture, Register Organization , Instruction formats, basic instruction cycle. Instruction interpretation and sequencing.<br>Control Unit: Soft wired (Micro-programmed) and hardwired control unit design methods. Microinstruction sequencing and execution. Micro operations, concepts of nano programming.Introduction to RISC and CISC architectures and design issues. Case study on 8085 microprocessor: Features, architecture, pin configuration and addressing modes. | **12** |
| 4 | **Memory Organization:**<br>Introduction to Memory and Memory parameters. Classifications of primary and secondary memories. Types of RAM and ROM, Allocation policies, Memory hierarchy and characteristics.<br>Cache memory: Concept, architecture (L1, L2, L3), mapping techniques. Cache Coherency, Interleaved and Associative memory.<br>Virtual Memory: Concept, Segmentation and Paging , Page replacement policies. | **12** |
| 5 | **I/O Organization and Peripherals:**<br>Input/output systems, I/O modules and 8089 IO processor.<br>Types of data transfer techniques: Programmed I/O, Interrupt driven I/O and DMA. Peripheral Devices: Introduction to peripheral devices, scanner, plotter, joysticks, touch pad. | **6** |
| 6 | **Introduction to parallel processing systems:**<br>Introduction to parallel processing concepts, Flynn's classifications, pipeline processing, instruction pipelining, pipeline stages, pipeline hazards. | **4** |

**Text Books:**

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw-Hill.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition.
3. William Stallings, "Computer Organization and Architecture: Designing for Performance", Eighth Edition, Pearson.
4. B. Govindarajulu, "Computer Architecture and Organization: Design Principles and Applications", Second Edition, Tata McGraw-Hill.

**Reference Books:**

1. Dr. M. Usha, T. S. Srikanth, "Computer System Architecture and Organization", First Edition, Wiley-India.
2. "Computer Organization" by ISRD Group, Tata McGraw-Hill.
3. Ramesh Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085, Fifth Edition,Penram.

**Oral examination will be based on the above syllabus.**

There will be at least eight assignments covering the above syllabus.

**Term Work**: 25 Marks (Total marks) = 20 Marks (Tutorials) + 5 Marks (Attendance)

**Note:** The faculty should conduct tutorials based on the above syllabus including two case studies on recent developments covering the above contents.
**8085 microprocessor should be included only as a sample case study. No questions in University Exams / Class Tests should be asked on 8085 microprocessor.**

**SUGGESTED LIST OF ASSIGNMENTS FOR COA TUTORIALS:**

1. To study Full Adder (7483).
2. To study ALU (74181).
3. To study MASM (Micro Assembler).
4. A program for hexadecimal addition and multiplication.
5. A program for binary multiplication.
6. A program for Hamming code generation , detection and correction.
7. A program for Booth's multiplication
8. A program for LRU page replacement algorithm.
9. A program for FIFO page replacement algorithm.
10. To study mapping techniques of Cache memory.
    10.1 Direct Mapped cache
    10.2 Associative Mapped cache
    10.3 Set Associative Mapped cache

11. To study memory allocation policies.
    11.1 First-fit algorithm
    11.2 Best-fit algorithm

12. A program to implement serial communication (PC - PC communication).
13. A program to implement parallel communication. (PC - Printer communication).

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/ Practical | Tutorial | Total |
| **SEITC404** | Automata Theory | 03 | -- | 01 | 03 | -- | 01 | 04 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| **SEITC404** | Automata Theory | 20 | 20 | 20 | 80 | 25 | --- | -- | 125 |

**Course Objectives:**

To build up mathematical fundamentals required to understand the theory of computation

1. To formalize mathematical models of computation: basic machines, deterministic and non deterministic machines and pushdown machines and Turing Machines.
2. To learn fundamentals of formal grammars and languages.
3. Develop understanding of different types of Turing machines, their use, capabilities & limitations.
4. Understand the concept of Undecidability

**Course Outcomes:** After completing the course successfully, students will be able to:

**1.** Design different types of machines.
**2.** Compare different types of languages and machines
**3.** Use the pumping lemma and closure properties to prove that some problems cannot be solved by particular machines.
**4.** Understand Power and Limitations of theoretical models of Computation.
**5.** Match constraints of a language to power of machines.

## Detailed Syllabus:

| Sr. No | Detail contents | Number of Hours |
|---|---|---|
| 1. | **Basic Mathematical Fundamentals:** Sets, Logic, Functions, Relations and Languages, pigeonhole principle, mathematical induction. | 02 |
| 2. | **Introduction and Finite Automata:** Alphabets, Strings, Languages, Finite Automata (FA), acceptance of strings, and languages, Deterministic Finite Automata (DFA) and Non Deterministic Finite Automata (NFA), transition diagrams and Language recognizers. Conversions and Equivalence: Equivalence between NFA with and without ε- transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines. | 06 |
| 3. | **Regular Expressions & Languages:** FA and Regular Expressions, Conversion from RE to FA and FA to RE, Pumping lemma for regular languages, Closure properties of regular languages, Equivalence and minimization of Automata. | 05 |
| 4. | **Context Free Grammars and Languages:** CFG, Leftmost, Rightmost derivations, Ambiguity in grammars and languages. Simplification of Context Free Grammars, Chomsky normal form (CNF), Greiback normal form (GNF), Pumping Lemma for Context Free Languages. | 04 |
| 5. | **Push Down Automata:** Definition and languages of PDA, Equivalence& conversion of CFG's and PDA's, Deterministic PDA. | 06 |
| 6. | **Turing Theory:** Turing Machines, definition, model, design of TM, Variations of TM: Multitape TMs, Non Deterministic TM, Universal TM, The Church-Turing thesis. | 08 |
| 7. | **Undecidability and Recursively enumerable languages: Recursive and** Recursively enumerable languages, Context-Sensitive Languages and the Chomsky Hierarchy.<br><br>Unsolvable Problems: Halting Problem, Post's Correspondence Problem (PCP). | 05 |

**TERM WORK**

Journal work should comprise of writing 10 assignments based on the above syllabus.
Use of JFLAP software is desirable for experimenting with formal languages: topics including nondeterministic finite automata, nondeterministic pushdown automata, multi-tape Turing machines, several types of grammars.

**TEXT BOOKS**

1. Kavi Mahesh, **"Theory of Computation A Problem Solving Approach"**, Wiley India

2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, **"Introduction to Automata Theory, Languages and Computation",** Pearson Education.

3. J.C.Martin, **"Introduction to languages and the Theory of Computation"**, TMH.

**REFERENCES**

1. Daniel I.A. Cohen, "**Introduction to Computer Theory"**, John Wiley & Sons.

2. Michael Sipser, **"Theory of Computation",** Cengage Learning.

3. N.Chandrashekhar& K.L.P. Mishra, "Theory of Computer Science, Automata Languages & Computations", PHI publications.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Subject Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/ Practical | Tutorial | Total |
| SEITC405 | Web Programming | 04 | 02 | -- | 04 | 01 | -- | 05 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| SEITC405 | Web Programming | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Objective:**

As the part played by Internet in our daily life increases so does the importance of methods and means of Web site realization. This course is devoted to acquire knowledge and skills for creation of Web site considering both client- and server-side programming.

**Outcome:**

Student must be able to:

- Learn basics of web architecture and web development.
- Acquire the knowledge of tools used in industry for web application development.
- □ Create theweb application using tools and techniques learned.

**Topics:**

- Introduction to web technologies
- Client side programming – HTML 5.0, XHTML, CSS, JavaScript
- Server side programming I – ASP.NET and JSP
- Server side programming II -- PHP
- Server side database connectivity
- Web extensions

**Detailed Syllabus**

| Sr. No. | Detail Contents | Weightage | Number of hours |
|---|---|---|---|
| 1 | Introduction to web technologies:<br>Introduction to OSI layers, Web system architecture- 1,2,3 and n tier architecture, URL, domain name system, overview of HTTP and FTP, Cross browser compatibility issues, W3C Validators,Web Site Design Issues: Planning a Web Site – Objective and Goals, Audience, Organizing contents, Publishing of Web Site. Function of Web Server | 05% | 03 |
| 2 | Client Side Programming– HTML 5.0, CSS and JavaScript:<br>Basic HTML, formatting and fonts, Anchors, images, lists, tables, frames and forms, Introduction to CSS, Using CSS for text, background, links and positioning, Introduction to JavaScript, JavaScript language constructs, Objects in JavaScript- Built in, Browser objects and DOM objects, event handling, form validation and cookies. Introduction to JQUERY, The Basics of JQUERY programming, form validation using JQUERY. | 25% | 12 |
| 3 | Server side programming I: ASP.NET and JSP<br>Introduction to c# language,ASP.NET essentials, Life cycle of ASP.NET application,Developing web forms using ASP.NET, Using ASP.NET server controls to create web forms, Session tracking , Introduction to servlet and JSP, life cycle of JSP and servlet, Introduction to basic objects in JSP. | 35% | 16 |
| 4 | Server side programming II: PHP<br>Introduction to PHP- Data types, control structures, built in functions,Building web applications using PHP- tracking users, Introduction to PHP framework. | 10% | 08 |
| 5 | Server side database connectivity:<br>Database connectivity using ADO.Net, JSP &JDBC connectivity with example,PHP and Mysql database connectivity with example. | 20% | 06 |
| 6 | Web Extensions:<br>XML, Introducing XSL, XSL elements, transforming with XSLT, Web feeds (RSS), Introduction to web services. | 05% | 03 |

**Text Books:**

1. "Web Technologies: Black Book", Dreamtech publication
2. "Learning PHP 5", David Sklar, O'Reilly Publication
3. "The Web Warior Guide to Web Programming", Bai, zak, Ekedahl,Farrell, CENGAGE Learning Publication

**Reference Books:**

1. "Internet and world wide web how to program", Deitel&Deitel, Prentice Hall publication
2. "Developing web applications", Ralph Moseley, M.T.Savaliya, Wiley Publication.
3. "Web Programming", Chris Bates, Third edition, Wiley publication
4. "Web Technologies", Uttam K. Roy, Oxford University Press

**Suggested Practical List:**

1. Web pages using HTML 5.0 using Dreamviewer (Preferred) / Any other HTML editor
2. Web pages using JavaScript illustrating the objects in JavaScript
3. Form validation/ event handling using jQuery
4. Web Application development using ASP.NET
5. Database connectivity with ADO.NET
6. Database connectivity using JDBC and JSP
7. Installation and configuration of WAMP server
8. Introduction of PHP framework(Yii,CakePHP, CodeIgniter) and simple application development using the same.
9. Web application development using PHP
10. Database connectivity with PHP
11. A mini project – Complete web site development using
    a. HTML, CSS, JavaScript and ASP.NET OR
    b. HTML, CSS, JavaScript and PHP

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Sub Code | Subject Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/pract | Tut | Total |
| SEITC406 | Information Theory and Coding | 4 | | 1 | 4 | 1 | -- | 5 |

| Sub Code | Subject Name | Examination Scheme | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory | | | | TW | Pr | Oral | |
| | | Internal Assessment | | | End Sem Exam | | | | |
| | | Test 1 | Test 2 | Avg. of Test 1 & 2 | | | | | |
| SEITC406 | Information Theory and Coding | 20 | 20 | 20 | 80 | 25 | -- | -- | 125 |

**Course Objective:**

To introduce to the students the concept of information and entropy of Information

To give the student the concept of compression of information , error control of Information, and securing information through cryptography.

To give the student the mathematical foundation of compression, error control and security of information.

**Course Outcome:**

Ability of students to understand true meaning of Information and Entropy

Ability of students to understand three aspects of information i.e. compression, error control and security.

**Detailed Syllabus:**

| Unit. No | Topics | Number of Hours |
|---|---|---|
| **1** | **Information Theory & Source Coding**<br>1.1. Introduction to Information Theory<br>1.2. Entropy & Types of Entropy<br>1.3. Source Coding<br>1.4. Prefix Coding<br>1.5. Channel Capacity | **8** |
| **2** | **Compression Algorithms**<br>2.1 Optimal Compression<br>2.2 Compression Algorithms<br>2.3 Huffman Coding, Adaptive Huffman Compression<br>2.4 Dictionary Based Compression<br>2.5 Speech Compression<br>2.6 Sliding Window Compression<br>2.7 LZW,RLE<br>2.8 Lossy & Lossless Compression Schemes<br>2.9 Image Compression – GIF,JPEG | **10** |
| 3 | **Error Control Coding Techniques**<br>3.1 Types of Codes<br>3.2 Error Checking & Correcting Codes<br>3.3 Linear Block Codes<br>3.4 Cyclic Codes<br>3.5 BCH Codes<br>3.6 Convolution Codes | **10** |
| **4** | Basic Number Theory<br>4.1 Modular Arithmetic<br>4.2 Solving ax+by=d<br>4.3 Congruences<br>4.4 Chinese Remainder Theorem<br>4.5 Modular Exponentiation<br>4.6 Fermat's Little and Euler Theorem<br>4.7 Prime Number Generation<br>4.8 Random Number Generation<br>4.9 Primitive Roots<br>4.10 Legendre and Jacobi Symbols<br>4.11 Discrete Probability<br>4.12 Discrete Logarithms | **12** |

| | | |
|---|---|---|
| 5 | Cryptographic Techniques<br>5.1 Security Goals, Threats and Attack on Information<br>5.2 Classic Cryptography<br>5.3 Symmetric Key Cryptography – Stream Ciphers, Block Cipher, Stream Cipher,DES,Triple DES,AES<br>5.4 Public and Private Key Cryptography – RSA,Diffie-Hellman<br>5.5 Hash Function – MD5,SHA-1,Digital Signature | 8 |

**Text Books:**


1. "Information Theory, Coding and Cryptography" Ranjan Bose, Tata McGrawHill , Second Edition.
2. "Information Coding Techniques" R Avudaiammal, Tata McGrawHill , Second Edition.
3. "Essentials of Error-Control Coding", Jorge Castineira Moreirra, Wiley-India Edition
4. "Introduction to Cryptogrpahy with Coding theory" Trappe and Washington" Pearson


**References:**


1. Element of information theory: Thomas Cover wiley

2. An introduction to Theory of numbers: Ivan nivan Wiley


**Tutorial:**

Journal work should comprise of writing 10 assignments based on the above syllabus.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.
- Weightage of marks should be proportional to number of hours assigned to each module.

# UNIVERSITY OF MUMBAI

## Bachelor of Engineering

**Information Technology (Third Year – Sem. V & VI)**

**Revised course**

**(REV- 2012) from Academic Year 2014 -15**

**Under**

## FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

## Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) and give freedom to affiliated Institutes to add few (PEO's) and course objectives and course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of engineering education.

Semester based Credit and Grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Credit and grading based system was implemented for First Year of Engineering from the academic year 2012-2013. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2013-2014, for Third Year and Final Year Engineering in the academic years 2014-2015 and 2015-2016 respectively.

**Dr. S. K. Ukarande**
**Dean,**
**Faculty of Technology,**
**Member - Management Council, Senate, Academic Council**
**University of Mumbai, Mumbai**

## Preamble:

The engineering education in India in general is expanding in manifolds. Now, the challenge is to ensure its quality to the stakeholders along with the expansion. To meet this challenge, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education and reflects the fact that in achieving recognition, the institution or program of study is committed and open to external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited. Program outcomes are essentially a range of skills and knowledge that a student will have at the time of graduation from the program. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

I, as Chairman, Board of Studies in Information Technology of University of Mumbai, happy to state here that, Program Educational Objectives were finalized in a meeting where more than 30 members from different Institutes were attended, who were either Heads or their representatives of Information Technology Department. The Program Educational Objectives finalized for undergraduate program in Information Technology are listed below;

1. To prepare Learner's with a sound foundation in the basics of engineering fundamentals.
2. To prepare Learner's to use effectively modern programming tools to solve real life problems.
3. To prepare Learner's for successful career in Indian and Multinational Organisations and to excel in Postgraduate studies
4. To encourage and motivate Learner's for entrepreneurship.
5. To inculcate professional and ethical attitude, good leadership qualities and commitment to social responsibilities in Learners.
6. To encourage Learner to use best practices and implement technologies to enhance information security and enable compliance, ensuring confidentiality, information integrity, and availability.

In addition to Program Educational Objectives, for each course of undergraduate program, objectives and expected outcomes from learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

**Dr. J. W. Bakal**
**Chairman, Board of Studies in Information Technology**
**University of Mumbai, Mumbai**

## Third Year Engineering (Semester V)
## Revised course for Information Technology
## Academic Year 2014-15 (REV- 2012)

| Sub Code | Subject Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tut. | Theory | TW/ Practical | Tut. | Total |
| TEITC501 | Computer Graphics and Virtual Reality | 4 | | | 4 | | | 4 |
| TEITC502 | Operating Systems | 4 | | | 4 | | | 4 |
| TEITC503 | Microcontroller and Embedded Systems | 4 | | | 4 | | | 4 |
| TEITC504 | Advanced Database Management Systems | 4 | | | 4 | | | 4 |
| TEITC505 | Open Source Technologies | 3 | | | 3 | | | 3 |
| TEITC506 | Business Communication and Ethics* | | 2**+2 | | | 2 | | 2 |
| TEITL501 | Computer Graphics and Virtual Reality | | 2 | | | 1 | | 1 |
| TEITL502 | Operating Systems | | 2 | | | 1 | | 1 |
| TEITL503 | Microcontroller and Embedded Systems | | 2 | | | 1 | | 1 |
| TEITL504 | Advanced Database Management Systems | | 2 | | | 1 | | 1 |
| TEITL505 | Open Source Technologies | | 2 | | | 1 | | 1 |
| | Total | 19 | 12 | | 19 | 07 | | 26 |

***Common for all programs.**
****Theory class to be conducted for entire class.**

**Note: During third year of engineering learners can be exposed to industrial environment by arranging an industrial visit.**

## Examination Scheme

| Course Code | Course Name | Theory | | | | | Term work | Pract/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Internal Assessment | | | End sem exam | Exam duration (in Hrs) | | | |
| | | TEST 1 | TEST 2 | AVG. | | | | | |
| TEITC501 | Computer Graphics and Virtual Reality | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC502 | Operating Systems | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC503 | Microcontroller and Embedded Systems | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC504 | Advanced Database Management Systems | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC505 | Open Source Technologies | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC506 | Business Communication and Ethics* | --- | --- | --- | --- | --- | 25 | 25 | 050 |
| | Total | 100 | 100 | 100 | 400 | 15 | 150 | 150 | 800 |

## Third Year Engineering (Semester VI)
## Revised course for Information Technology
## Academic Year 2014 -15 (REV- 2012)

| Subject Code | Subject Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tut. | Theory | TW/Pract. | Tut. | Total |
| TEITC601 | Software Engineering | 4 | | | 4 | | | 4 |
| TEITC602 | Distributed Systems | 4 | | | 4 | | | 4 |
| TEITC603 | System and Web Security | 4 | | | 4 | | | 4 |
| TEITC604 | Data Mining and Business Intelligence | 4 | | | 4 | | | 4 |
| TEITC605 | Advance Internet Technology | 4 | | | 4 | | | 4 |
| TEITL601 | Software Engineering | | 2 | | | 1 | | 1 |
| TEITL602 | Distributed Systems | | 2 | | | 1 | | 1 |
| TEITL603 | System and Web Security | | 2 | | | 1 | | 1 |
| TEITL604 | Data Mining and Business Intelligence | | 2 | | | 1 | | 1 |
| TEITL605 | Advance Internet Technology | | 2 | | | 1 | | 1 |
| | Total | 20 | 10 | | 20 | 05 | | 25 |

## Examination Scheme

| Course Code | Course Name | Theory | | | | | Term work | Practical /Oral | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Internal Assessment | | | End Sem exam | Exam duration (in Hrs) | | | |
| | | TEST 1 | TEST 2 | AVG. | | | | | |
| TEITC601 | Software Engineering | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC602 | Distributed Systems | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC603 | System & Web Security | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC604 | Data Mining & Business Intelligence | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| TEITC605 | Advance Internet Technology | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| | Total | 100 | 100 | 100 | 400 | 15 | 125 | 125 | 750 |

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/ Practical | Tutorial | Total |
| TEITC501 | Computer Graphics And Virtual Reality | 04 Hrs./Week | 02 Hrs./Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITC501 | Computer Graphics And Virtual Reality | 20 | 20 | 20 | 80 | 25 | 25 | --- | 150 |

| **Course Objectives** | |
|---|---|
| **1** | The objective of the course is to equip students with the fundamental knowledge and basic technical competence in the field of computer graphics. |
| **2** | Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes so as to fit them as per the picture definition. |
| **3** | Provide an understanding of mapping from a world coordinates to device coordinates, clipping, solid modeling, rendering, and projections. |
| **4** | To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications. |

| **Course Outcomes** | |
|---|---|
| **1** | Students shall have understood basic concepts of computer graphics. |
| **2** | Students shall have understood algorithms to scan convert the basic geometrical primitives, transformations, Area filling, clipping. |
| **3** | Students shall have understood the fundamentals of animation, Virtual reality ,the related technologies, and shall be able to describe applications of Virtual Reality. |

**DETAILED SYLLABUS**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1. | **Introduction to Computer graphics and Output primitives** | Introduction, Display Devices, Bitmap and Vector based graphics, Overview of Coordinate system, Scan Conversion of**:**point, line using Digital differential analyzer& Bresenham's algorithm, circle using midpoint approach, Curve Generation **:** Bezier and B-Spline curves. Introduction to fractals: generation procedure, classification, dimension and Koch Curve. | **10** |
| 2. | **Area Filling and Two Dimensional Transformations** | Area filling **:** Inside/Outside Test , Scan line Polygon Fill Algorithm , Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D transformations : Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation. | **8** |
| 3. | **Two Dimensional Viewing** | Introduction ,Viewing Pipeline , View Coordinate reference frame ,Window to viewport transformation, Point clipping, Line clipping**:** Cohen Sutherland Algorithm, Liang Barsky algorithms, Polygon clipping**:** Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping. | **6** |
| 4. | **Three Dimensional Transformation,Viewing and Projection.** | Three Dimensional transformations**:** Translation, Scaling, Rotations, Composite. Three Dimensional object representation: Polygon Surfaces, Tables, Meshes. Three Dimensional Viewing Pipeline , Viewing transformation , Projections **:** Parallel(Oblique and orthographic), Perspective (one Point) | **6** |
| 5. | **Introduction to Animation** | Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping( only Mesh Warping). | **2** |
| 6. | **Introduction to Virtual Reality** | Virtual Reality : Basic Concepts , Classical Components of VR System , Types of VR Systems, Three Dimensional Position Trackers, Navigation and Manipulation Interfaces, Gesture | **8** |

| | | | |
|---|---|---|---|
| | | Interfaces, Graphical Display, Sound displays, and Haptic Feedback . Input Devices ,Graphical Rendering Pipeline , Haptic Rendering Pipeline, Open GL rendering pipeline.Applications of Virtual Reality. | |
| 7 | **Modeling** | Geometric Modeling: Virtual Object Shape, Object Visual Appearance.Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling: Collision Detection, Surface Deformation, Force Computation. Behavior Modeling. | **4** |
| 8 | **Introduction to VR programming** | Introduction , Programming through VRML : Defining and Using Nodes and Shapes , VRML Browsers , Java 3D :Visual Object Definition by Shape 3D instances , Defining personal visual object class, ColorCube Class, Geometric – Utility Classes, Geometry Classes , Attributes. | **4** |

**Text Books**


1 Donald Hearn and M. Pauline Baker, "Computer Graphics", Pearson Education.

2 R. K Maurya, "Computer Graphics with Virtual Reality", Wiley India.


**Reference Books**


1 Grigore Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley.

2 Steven Harrington, "Computer Graphics", McGraw Hill.

3 Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill.

4 Vince, "Virtual Reality Systems", Pearson Education.

5 F.S. Hill , Stephen M. Kelley , "Computer Graphics using Open GL" Prentice Hall

**Term work:** Term Work shall consist of programs based on the given list. Journal must include at least 2 assignments.

**Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Suggested Practical List:**

1. Implementation of Line Drawing algorithms : DDA , Bresenham and using them generating line with different styles like dotted , dashed , centered and thick line.
2. Implementation of Circle generation algorithm : Midpoint and using it generating concentric circles.
3. Implementation of Area Filling Algorithm : Boundary Fill , Flood Fill and Scan line Polygon Fill.
4. Curve Generation : Bezier for n control points , B Spline (Uniform )
5. Fractal Generation (Koch Curve)
6. Program for performing Two Dimensional Transformations : Translation , Scaling , Rotation , Reflection , Shear by using a homogeneous Matrix representation ,use of a function for matrix multiplication is desirable , so as to perform composite transformation.
7. Implementation of Line Clipping Algorithm : Cohen Sutherland , Liang Barsky.
8. Implementation of Polygon Clipping Algorithm : Sutherland Hodgman.
9. Program to represent a 3D object using polygon surfaces and then perform 3D transformation.
10. Program to perform projection of a 3D object on Projection Plane : Parallel and Perspective.
11. Program for Animation.

    It is desirable to implement some of the experiments by using Open GL.

    ***In addition at least 3 programs using VRML and JAVA 3D APIs.***

    It is recommended to encourage the student to form a group for a mini project ( a simple graphical utility) and for them submitting a theoretical Q. / A. type assignments can be kept optional.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.
- Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | TW/ Practical | Tutorial | Total |
| TEITC502 | Operating Systems | 04 Hrs./Week | 02 Hrs./Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test2 | Avg. of 2 Tests | | | | | |
| TEITC502 | Operating Systems | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Pre-requisites:** Data structures, Programming Language (C / JAVA), Computer Organization & Architecture.

**Course Objectives:**

- To understand the main components of an OS & their functions.
- To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.
- To understand the concepts and implementation of virtual memory.
- To understand various issues in Inter Process Communication (IPC) and the role of OS in IPC.
- To study different file systems of OS like Linux, Windows and overview of OS for mobile & hand held devices.

**Course Outcomes:**

- Student will learn important computer system resources and their management policies, algorithms used by operating systems.
- Student will understand what makes a computer system function and the primary PC components.
- Student will understand the working of an OS as a manager of various resources.
- Student will implement some of the functions of OS such as scheduling policies, page replacement algorithms, IPC.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **Overview of Operating System** | Operating system objectives and functions, Evolution of OS, Characteristics of modern OS, Basic concepts: Processes, Files, System calls, Shell, Kernel architectures: Monolithic, Micro-kernel, Layered, Kernel mode of operations. | **4** |
| 2 | **Process Management** | Process description: Process, Process States, Process Control Block (PCB), Threads, Thread management.<br>Process Scheduling: Types, Comparison of different scheduling policies. | **10** |
| 3 | **Process Co-ordination** | Principles of Concurrency, Race condition and critical section, Mutual Exclusion- Hardware and Software approaches, Semaphores, Monitors, Message Passing, Producer Consumer Problem.<br>Deadlock: Principles of Deadlock, Deadlock Detection, Deadlock Avoidance, Deadlock Prevention**.** | **10** |
| 4 | **Memory Management** | Memory Management Requirements, Memory Partitioning, Virtual memory: Paging; Segmentation; Page replacement policies, page faults. | **6** |
| 5 | **Input Output Management** | I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling and disk scheduling algorithms, Disk cache. | **6** |
| 6 | **File Management** | Overview, File Organization, File Sharing; Record Blocking; Secondary Storage Management. | **6** |
| 7 | **Case Studies** | Producer Consumer Problem, Multithreading, RAID, File systems of Windows and Linux , Overview of Android OS. | **6** |

**Text Books:**


1. Modern Operating Systems, Tanenbaum, III$^{rd}$ Edition, PHI
2. Operating System-Internal & Design Principles, VI$^{th}$ Edition, William Stallings, Pearson
3. Operating Systems Concepts, Silberschatz A., Galvin P., Gagne G, VIII$^{th}$ Edition Wiley.
4. Principles of Operating Systems, Naresh Chauhan, First Edition , Oxford university press.


**References:**


1. Operating Systems in Depth, Thomas W. Doeppner, Wiley.
2. Operating System Programming and Operating Systems, D M Dhamdhere, II$^{nd}$ Revised Edition, Tata McGraw.
3. Operating Systems, *Achyut S. Godbole,* 2nd edition, Tata McGraw Hill.
4. Application development using Android, Hello, Android, mobile development platform, Ed Burnette, 3rd Edition.
5. Linux Command Line & Shell Scripting, Richard Blum and Christine Bresnahan, 2nd edition, Wiley.


**Term work:** Term Work shall consist of programs based on the given list. Journal must include at least 2 assignments.

**Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)
**Oral Examination will be based on the above syllabus**.
**Suggested Practical List:**

1. Implementation of System Calls (at least five).
2. Implementation of CPU Scheduling Policies (both pre-emptive and non pre-emptive).
3. Implementation of Page Replacement Algorithms.
4. Implementation of IPC (Producer Consumer problem) .
5. Implementation of Multithreading.
6. Implementation of Deadlock Avoidance algorithm (Bankers algorithm).

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.
- Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tut. | Theory | TW/ Practical | Tut. | Total |
| TEITC503 | Microcontroller and Embedded Systems | 04 Hrs./Week | 02 Hrs./Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Practical | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| | | Test1 (T1) | Test2 (T2) | Average of T1 & T2 | | | | | |
| TEITC503 | Microcontroller and Embedded Systems | 20 | 20 | 20 | 80 | 25 | - | 25 | 150 |

**Pre-requisites: Fundamentals of Computer, Digital Logic Circuits, Computer Organization and Architecture**

**Course Objectives:**

| | |
|---|---|
| **CEO 1** | To conceptualize the basics of embedded systems |
| **CEO 2** | To conceptualize the basics of organizational and architectural issues of a microcontroller. |
| **CEO 3** | To learn programming techniques used in microcontroller. |
| **CEO 4** | To understand basic concept of ARM processor |
| **CEO 5** | To understand fundamentals of real time operating system |

**Course Outcomes:**

| | |
|---|---|
| **A** | Ability to understand basic structure embedded systems |
| **B** | Ability to understand basic structure microcontroller. |
| **C** | Ability to understand basic concepts used in embedded system. |
| **D** | Ability to program microcontroller. |
| **E** | Ability to design conceptual embedded system. |

**Detailed Syllabus:**

| Module | Detailed Contents | Hours |
|---|---|---|
| **1** | **Introduction to Embedded Systems:** Overview of Embedded System Architecture, Application areas, Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC. | **06** |
| **2** | **The Microcontroller Architecture:** Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, Interrupts. | **08** |
| **3** | **Assembly Language Programming of 8051:** Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and ISR. | **10** |
| **4** | **ARM 7 architecture:** Architectural inheritance, Detailed study of Programmer's model, ARM Development tools, Instruction set: Data processing, Data transfer, Control flow. Addressing modes. Writing simple assembly language programs. Pipelining, Brief introduction to exceptions and interrupts handling. | **10** |
| **5** | **Embedded / Real Time Operating System:** Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems, Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems. | **8** |
| **6** | **Embedded System - Design case studies:** Digital clock, Battery operated smart card reader, Automated meter reading system, Digital camera. | **06** |

**Text Books:**

1. The 8051 microcontroller & Embedded systems, M. A. Mazidi, J. G. Mazidi, R. D. McKinlay, Pearson
2. The 8051 microcontroller & Embedded systems, Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learning
3. Embedded / real – time systems: concepts, design & programming, Black Book, Dr. K. V. K. K. Prasad, Dreamtech press, Reprint edition 2013
4. Introduction to embedded systems, Shibu K. V., McGraw Hill
5. ARM System on chip Architecture, Steve Furber, Pearson, edition second

**Reference Books:**

1. Embedded systems an integrated approach, Laya B. Das, Pearson, Third impression, 2013
2. ARM system developer's guide, Andrew N. Sloss, Dominic Symes, Chris Wright, Morgan Kaufmann Publishers
3. Embedded system design A Unified hardware/software Introduction, Frank Vahid, Tony Givargis, Wiely
4. ARM Technical Reference manual

**Term Work**: 25 Marks (Total marks) = 15 Marks (Experiment and Case Studies) + 5 Marks (Assignments) + 5 Marks (Attendance)

The faculty should conduct eight programming practicals/experiments based on the above syllabus and two case studies based on recent trends in embedded systems.

**Oral examination will be based on the above syllabus.**

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.
- Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| TEITC504 | Advanced Database Management Systems | 04 Hr/week | 02 Hr/week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test2 | Avg. of 2 Tests | | | | | |
| TEITC504 | Advanced Database Management Systems | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

1. To reinforce and strengthen the database concepts learned in the basic course in database technologies
2. To impart skills that can help design and implement advanced queries using Structured Query Language.
3. To equip students with knowledge to implement and integrate databases in actual applications.
4. To make students aware of how databases are actually stored and accessed.
5. To introduce advanced concepts of transaction management and recovery techniques.
6. To initiate awareness about the potential security threats that exist in database systems and how to tackle them

7. To introduce other database models like distributed and object based
8. To create awareness of how enterprise can organize and analyze large amounts of data by creating a Data Warehouse.

**Course Outcomes: At the end of the course the student will be able to:**

1. Construct complex queries using SQL to retrieve and manipulate information in a database.
2. Design and implement full-fledged real life applications integrated with database systems.
3. Clearly understand how databases are actually stored and accessed; How transaction ACID properties are maintained and how a database recovers from failures.
4. Apply security controls to avoid any type of security incidents on vital database systems.
5. Design advanced data systems using Object based systems or Distributing databases for better resource management.
6. Understand the importance of enterprise data and be able to organize data to perform analysis on the data and take strategic decisions.

**DETAILED SYLLABUS**

| Sr. No. | Module | Detailed Content | Hours | Weightage |
|---|---|---|---|---|
| 1 | **Introduction** | Reviewing basic concepts of a relational database, Basic SQL | **01** | **0%** |
| 2 | **Advanced SQL** | Complex Retrieval Queries using Group By, Recursive Queries, nested Queries ; Specifying Constraints as Assertions; Event Condition Action (ECA) model (Triggers) in SQL; Creating and working with Views in SQL; Database Programming: Embedded SQL, Dynamic SQL and SQLJ, Database Programming with Function Calls: JDBC; Stored Procedures in SQL, Embedded SQL, Dynamic SQL. | **06** | **10%** |

| | | | | |
|---|---|---|---|---|
| 3 | **Advanced Transaction Processing & Recovery** | Review of ACID properties and Serializability; Multiversion Concurrency Control Techniques; Granularity of Data Items and Multiple Granularity Locking ; Advanced Database Recovery techniques like Write Ahead Logging (WAL), ARIES, Checkpoints. | **06** | **10%** |
| 4 | **Data Security** | Introduction to Database Security Issues; Discretionary Access Control Based on Granting and Revoking Privileges; Mandatory Access Control and Role-Based Access Control for Multilevel Security; SQL Injection; Introduction to Statistical Database Security Introduction to Flow Control | **04** | **10%** |
| 5 | **Storage and Indexing** | Operation on Files; hashing Techniques; Types of Single-Level Ordered Indexes; Multilevel Indexes; Dynamic Multilevel Indexes Using B-Trees and B+-Trees; Indexes on Multiple Keys. | **04** | **10%** |
| 6 | **Distributed Databases** | Types of Distributed Database Systems; Distributed Database Architectures; Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design; Query Processing and Optimization in Distributed Databases; Overview of Transaction Management in Distributed Databases; Overview of Concurrency Control and Recovery in Distributed Databases. | **06** | **10%** |
| 7 | **Object Based Databases** | Overview of Object Database Concepts; Object-Relational Features; Object Database Extensions to SQL; The Object Definition Language ODL; Object Database Conceptual Design; The Object Query Language OQL. | **05** | **10%** |
| 8 | **Introduction to Data** | The Need for Data Warehousing; Increasing Demand for Strategic Information; Inability of Past Decision Support System; Operational Vs Decisional Support System; 1.3 Data | **02** | **5%** |

| | | | | |
|---|---|---|---|---|
| | **Warehousing** | Warehouse Defined; Benefits of Data Warehousing ;<br><br>Features of a Data Warehouse; The Information Flow Mechanism; Role of Metadata; Classification of Metadata; Data Warehouse Architecture; Different Types of Architecture; Data Warehouse and Data Marts; Data Warehousing Design Strategies. | | |
| 9 | **Dimensional Modeling** | Data Warehouse Modeling Vs Operational Database Modeling; Dimensional Model Vs ER Model; Features of a Good Dimensional Model; The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables:; he Factless Fact Table; Updates To Dimension Tables: Slowly Changing Dimensions, Type 1 Changes, Type 2 Changes, Type 3 Changes, Large Dimension Tables, Rapidly Changing or Large Slowly Changing Dimensions, Junk Dimensions, Keys in the Data Warehouse Schema, Primary Keys, Surrogate Keys & Foreign Keys; Aggregate Tables; Fact Constellation Schema or Families of Star. | **06** | **15%** |
| 10 | **ETL Process** | Challenges in ETL Functions; Data Extraction; Identification of Data Sources; Extracting Data: Immediate Data Extraction, Deferred Data Extraction; Data Transformation: Tasks Involved in Data Transformation, Data Loading: Techniques of Data Loading, Loading the Fact Tables and Dimension Tables Data Quality; Issues in Data Cleansing. | **04** | **10%** |
| 11 | **Online Analytical Processing (OLAP)** | Need for Online Analytical Processing; OLTP vs OLAP; OLAP and Multidimensional Analysis; Hypercubes; OLAP Operations in Multidimensional Data Model; OLAP Models: MOLAP, ROLAP, HOLAP, DOLAP; | **04** | **10%** |

**Text Books:**


1. Elmasri and Navathe, "Fundamentals of Database Systems", 6th Edition, PEARSON Education.
2. Korth, Slberchatz,Sudarshan, :"Database System Concepts", 6th Edition, McGraw – Hill
3. Theraja Reema, "Data Warehousing", Oxford University Press, 2009


**References:**


1. Paulraj Ponniah, "Data Warehousing: Fundamentals for IT Professionals", Wiley India.
2. C. J. Date, A. Kannan, S. Swamynathan "An Introduction To Database Systems", 8th Edition Pearson Education.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems" 3rd Edition - McGraw Hill
4. Ralph Kimball, Margy Ross, "The Data Warehouse Toolkit: The Definitive Guide To Dimensional Modeling", 3rd Edition. Wiley India.


**Oral Exam:**

An oral exam will be held based on the above syllabus.

**Term work**:

Assign a case study for group of 2/3 students and each group to perform the following experiments on their case-study:

**Suggested Practical List**

1. Problem Definition and draw ER /EER diagram
2. Creation of the database: using constrains and triggers
3. Advanced SQL – must cover Views, nested and recursive queries.
4. Implementing an application and integrating with the database using JDBC, Dynamic and embedded SQL
5. Any one Database Hashing technique
6. Implementing and index using B or B+ trees.
7. Creating and querying an Object database. – Use ODL and OQL ( Paper Exercise-Assignment)

8. Implementing a Distributed Database.
9. Demonstration of database security techniques – SQL injection, inference attacks etc.
10. Problem Definition for a Data Warehouse, Construction of Star Schema Model.
11. Creation of a DW and running OLAP operations on them ( Roll up, Drill down, Slice, Dice, pivot)

**Tools used:**

1. Any Database software like Oracle, DB2, SQL Server, MY SQL or any other open source tools.
2. Programming to be done in JAVA.

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| TEITC505 | Open Source Technologies | 03 Hr/Week | 02 Hr/Week | --- | 03 | 01 | --- | 04 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITC505 | Open Source Technologies | 20 | 20 | 20 | 80 | 25 | 25 | --- | 150 |

**Course Objectives:**

1. To introduce the concept of open Source Software.
2. To enable students to learn Linux Environment.
3. To make students well versed with Android and Shell Programming

**Course Outcomes: On successful completion of this course students should be able:**

1. To develop android applications.
2. To install and work on Linux.
3. To perform Shell Programming.

**DETAILED SYLLABUS**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1. | Over View of Open Source Software | Need of Open Sources –Advantages of Open sources – Applications- FOSS – FOSS usage –Free Software Movement – Comercial Aspect of Open Source Movement – Licensing – Certification – Open Source Software Development Model – comparision with close source / Proprietary software – Free Software – Open source vs source –available –Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License. | 04 |
| 2. | Open Source Operating System | Installation of Linux (Redhat-CentOS): Theory about Multiboot Enviroment, Hardisk Partitioning, Swap space, LVM, and Bootloader<br>Command Line: Basic File System Manamgnet Task, Working with files, Piping and Redirection, Working with VI editor, use of sed and understanding FHS of Linux | 04 |
| 3. | Open Source Operating System: system Administrator task | Job management, Process Mangment, Mounting Devices and filesystem working with Linux, Backup, working with user, group and permission, Managing Software. Understanding Boot process and related files, Common kernel Manamgnet Task | 04 |
| 4. | Open source Operating System:<br>Network and Security Administration | Basic networking commands, Configuration of Apache Web servers, DNS servers, DHCP servers, mail Servers, NFS, FTP servers.<br>Securing servers with IPtables. Setting up cryptographic services, SSL, Managing Certificate with OpenSSL, working with the GNU Privacy guard. | 06 |

| | | | |
|---|---|---|---|
| 5. | Open Source Operating System:<br><br>Shell Programming | Bash Shell Scripting, Executing Script, Working with Variables and Input, Using Control Strutures, Script control, handling with signals, Creating functions, working sed and gawk<br><br>-Working with web using shell script: Downloading web page as formatted text file and parsing for data, working cURL etc. | 08 |
| 6. | Open source Tools<br><br>Only in LAB | Version Control using RCS and CVS (hands on RCS in single Machine)<br><br>Content management : Understanding working of Drupal (Basic Drupal components)<br><br>Security assessment : OpenVAS<br><br>IDE :Working of Eclipse | --- |
| 7. | Open Source Mobile Programming | Android programming:<br><br>Setting up Android Enviroment (using Eclipse for android development), Activites and Intents, User Interface, Designing UI using views, Data Persistence, Conent Providers, messaging and networking, Location-based Services, Publishing Android Applications | 10 |

**Text Books:**


1. Redhat Linux 6.0 Administration Wiley
2. Linux Shell scripting Cookbook: Sarath Lakshman PACKT
3. Linux Lab - Open source Technology : Ambavade -Dreamtech
4. Beginning Adnorid Development Wrox Press


**References:**


**1.** Drupal guide to Planning and Building Web Site: Wrox Press


**Term Work**: 25 Marks (Total marks) = 15 Marks (Experiment and Case Studies) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Suggested Practical List :**

**1.** Linux command line : File System, Process Managment User Administration

2. Setting Up Web server, DNS server, FTP Servers

3. Working with IPTABLES, OpenVAS

4. Version Control

5. Working with Drupal

6. Shell Script

7. Andorid Setup

8. Programning in Andorid

9. Programming in Android

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course/Subject Name | Credits |
|---|---|---|
| **TEITC506** | **Business Communication &Ethics** | **2** |

**Pre-requisite**

- FEC206 Communication Skills

## Objective

1. To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach and an ability to understand engineer's social responsibilities.
2. To provide students with an academic environment where they will be aware of the excellence, leadership and lifelong learning needed for a successful professional career.
3. To inculcate professional ethics and codes of professional practice
4. To prepare students for successful careers that meets the global Industrial and Corporate requirement' provide an environment for students to work on Multidisciplinary projects as part of different teams to enhance their team building capabilities like leadership, motivation, teamwork etc.

**Outcomes:**A learner will be able to …..

1. communicate effectively in both verbal and written form and demonstrate knowledge of professional and ethical responsibilities
2. Participate and succeed in Campus placements and competitive examinations like GATE, CET.
3. Possess entrepreneurial approach and ability for life-long learning.
4. Have education necessary for understanding the impact of engineering solutions on Society and demonstrate awareness of contemporary issues.

**DETAILED SYLLABUS:**

| Module | Unit No. | Topics | Hrs |
|---|---|---|---|
| **1.0** | **1.0** | **Report Writing** | **08** |
| | 1.1 | Objectives of report writing | |
| | 1.2 | Language and Style in a report | |
| | 1.3 | Types of reports | |
| | 1.4 | Formats of reports: Memo, letter, project and survey based | |
| **2.0** | **2.0** | **Technical Proposals** | **02** |
| | 2.1 | Objective of technical proposals | |
| | 2.2 | Parts of proposal | |
| **3.0** | **3.0** | **Introduction to Interpersonal Skills** | **08** |
| | 3.1 | Emotional Intelligence | |
| | 3.2 | Leadership | |

| | | | |
|---|---|---|---|
| | 3.3 | Team Buliding | |
| | 3.4 | Assertiveness | |
| | 3.5 | Conflict Resolution | |
| | 3.6 | Negotiation Skills | |
| | 3.7 | Motivation | |
| | 3.8 | Time Management | |

| | | | |
|---|---|---|---|
| **4.0** | **4.0** | **Meetings and Documentation** | **02** |
| | 4.1 | Strategies for conducting effective meetings | |
| | 4.2 | Notice | |
| | 4.3 | Agenda | |
| | 4.4 | Minutes of the meeting | |
| **5.0** | **5.0** | **Introduction to Corporate Ethics and etiquettes** | **02** |
| | 5.1 | Business Meeting etiquettes,Interview etiquettes,Professional and work etiquettes,Social skills | |
| | 5.2 | Greetings and Art of Conversation | |
| | 5.3 | Dressing and Grooming | |
| | 5.4 | Dinning etiquette | |
| | 5.5 | Ethical codes of conduct in business and corporate activities (Personal ethics,conflicting values,choosing a moral response,the process of making ethical decisions) | |
| **6.0** | **6.0** | **Employment Skills** | **06** |
| | 6.1 | Cover letter | |
| | 6.2 | Resume | |
| | 6.3 | Group Discussion | |
| | 6.4 | Presentation Skills | |
| | 6.5 | Interview Skills | |
| | | **Total** | **28** |

## List of Assignments

1. Report Writing (Synopsis or the first draft of the Report)
2. Technical Proposal (Group activity,document of the proposal)
3. Interpersonal Skills (Group activity and Role play)
4. Interpersonal Skills ( Documentation in the form of soft copy or hard copy)
5. Meetings and Documentation ( Notice,Agenda,Minutes of Mock Meetings)
6. Corporate ethics and etiquettes (Case study,Role play)
7. Cover Letter and Resume
8. Printout of the PowerPoint presentation

**Term Work**
Term work shall consist of all assignments from the list.

The distribution of marks for term work shall be as follows:

- Assignments **:** **20 marks**
- Project Report Presentation**:** **15 marks**
- Group Discussion**:** **10 marks**
- Attendance **:** **05 marks**

The final certification and acceptance of term work ensures the satisfactory performance of work assigned and minimum passing in the term work.

**Reference Books:**


1. Fred Luthans, "*Organisational Behavior"* , Mc Graw Hill, edition
2. Lesiker and Petit, "*Report Writing for Business"* , Mc Graw Hill, edition
3. Huckin and Olsen, "*Technical Writing and Professional Communication"*, Mc Graw Hill
4. Wallace and Masters, "*Personal Development for Life and Work"* , Thomson Learning, 12th edition
5. Heta Murphy, "*Effective Business Communication"* , Mc Graw Hill, edition
6. R.C Sharma and Krishna Mohan, "*Business Correspondence and Report Writing",*
7. B N Ghosh, "*Managing Soft Skills for Personality Development*", Tata McGraw Hill.Lehman, Dufrene, Sinha, "*BCOM*", Cengage Learning, 2nd edition
8. Bell .Smith,"Management Communication" Wiley India Edition,3rdedition.Dr.K.Alex ,"Soft Skills",S Chand and Company
9. Dr.KAlex,"SoftSkills",S Chand and Company

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/ Oral | Tutorial | Total |
| TEITC601 | Software Engineering | 04 Hr/Week | 02 Hr/Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITC601 | Software Engineering | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

This course will study a collection of methods which embody an "engineering" approach to the development of software. It will discuss the nature of software and software projects, software development models, software process maturity, project planning, management, and estimations. Students are required to study and practice methods for analysis, design, testing, and implementation of large, complex software systems. We will inquire into the various perspectives on software quality -- what it means, how to measure it, how to improve it. The major work of the course should be a group project.

**Course Outcomes:**

1. Meet the Information Technology Program Objectives of identifying and solving engineering problems
2. To understand principles, concepts, methods, and techniques of the software engineering approach to producing quality software for large, complex systems.
3. To function effectively as a member of a team engaged in technical work.
4. To think critically about ethical and social issues in software engineering for different applications

**DETAILED SYLLABUS**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | Introduction to Software Engineering | Professional Software Development, Layered Technology, Process framework, CMM, Process Patterns and Assessment | **03** |
| 2 | Process Models | Prescriptive Models : Waterfall Model, Incremental, RAD Models Evolutionary Process Models:Prototyping, Spiral and Concurrent Development Model Specialized Models: Component based, Aspect Oriented development | **06** |
| 03 | Agile Software Development | Agile Process and Process Models, Adaptive and Dynamic system Development, Scrum, Feature Driven Development and Agile Modeling | **03** |
| 04 | Engineering and Modeling Practices | Core Principles, Communication, Planning, Modeling, Construction and deployment. System Modeling and UML | **04** |
| 05 | Requirements Engineering and Analysis Model | Requirements Engineering Tasks, Elicitation, building analysis model, Data Modeling concepts, Object Oriented Analysis | **06** |
| 06 | Design Engineering | Design Concepts, Design Model – Data, Architecture, Interface, Component Level and Deployment Level design elements | **05** |
| 07 | Testing strategies and tactics | Testing strategies for conventional and Object Oriented architectures, Validation and system testing<br><br>Software testing fundamentals, Black box and white box testing, Object Oriented testing methods | **06** |
| 08 | Metrics for Process and Projects | Process Metrics and Project Metrics, Software Measurement, Object Oriented Metrics, Software Project Estimation, Decomposition Techniques, LOC based, FP based and Use case based estimations, Empirical estimation Models | **06** |

| | | | |
|---|---|---|---|
| 09 | Risk Management | Risk strategies, Software risks, Risk Identification, Projection, RMMM | **03** |
| 10 | Quality Management | Quality Concepts, SQA activities, Software reviews, FTR, Software reliability and measures, SQA plan | **03** |
| 11 | Change Management | Software Configuration Management, elements of SCM, SCM Process, Change Control | **03** |

**Text Books:**

1. "Software Engineering : APractitioner's Approach" by Roger Pressman Sixth Edition
2. "Software Engineering" by Ian Sommerville, Pearson
3. "Software Engineering : A Precise Approach" Pankaj Jalote , Wiley India

**References: (for Practical)**

1. "System Analysis and Design" Alan Dennis, Wixom, R M Roth – Wiley India
2. "Software Engineering : Principles and Practice" by Waman S Jawadekar

**Term work:** Should be based on the Project work done as a team.

**Suggested Practical List:**

The focus of the lab component of this course is to apply software engineering methods for carrying out a software development mini project. Students will be assigned to teams of 3-4 students. Each team will be assigned to produce a software development model, complete with specifications, prototyping, and design.

The deliverables required may be:

1. Application of agility principles/process model selection/system modeling tools for the given scenario
2. Requirements gathering, elicitation, elaboration, negotiation, specification, validation using appropriate tools
3. Use case development
4. Activity diagram, class diagrams, swimlane, data flow diagrams, State diagrams and sequence diagrams
5. Data design model, Architecture, UI, Collaboration diagrams
6. Component Level Design
7. Design unique test cases on different strategies
8. Prepare project Plan, predict resources and timeline(scheduling)
9. Prepare a risk identification and management plan

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| TEITC602 | Distributed Systems | 04 Hr/Week | 02 Hr/Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITC602 | Distributed Systems | 20 | 20 | 20 | 80 | 25 | 25 | --- | 150 |

**Course Objectives:**

Distributed Systems form a significant field in Information Technology. The course aims to provide solid foundation in the concepts of distributed systems along with its design and implementation. Synchronization, Message Passing, Remote Communication, Consistency Management and Application development using different Distributed Technologies form part of core concepts to be studied under this course.

**Course Outcomes:**

- The student gains clear understanding of fundamental principles of Distributed Systems along with design and implementation of key mechanisms, Clock Synchronization, Election Algorithms, Mutual Exclusion, Message Communication, Process and Resource Scheduling etc.
- The student understands the message communication, remote procedure call and Remote method invocation (RPC and RMI) along with group communication.
- Emphasis is on developing applications using current distributed computing technologies like EJB, CORBA and .NET.
- Student should be able to develop/design distributed system/applications for an enterprise using SOA

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours 48 |
|---|---|---|---|
| 1 | Fundamentals | Introduction, Distributed Computing Models, Software Concepts, Issues in designing Distributed System, Client – Server Model | **4** |
| 2 | Communication | Message Passing , Introduction to Message Passing, Advantages and features of Message Passing, Message Format, Message Buffering, Multi Data gram Messaging , Group Communication<br><br>Remote Procedure Call (RPC): Basic RPC Operations, Parameter Passing, Extended RPC Models<br><br>Remote Object Invocation: Distributed Objects, Binding a Client to an Object, Static Vs Dynamic RMI, Parameter Passing, Java RMI<br><br>Message Oriented Communication: Persistence and synchronicity in communication, Message Oriented Transient and Persistent Communications | **8** |
| 3 | Processes | Threads, Code Migration: Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems | **4** |
| 4 | Synchronization | Clock Synchronization, Physical and Logical Clocks, Global State, Election Algorithms, Mutual Exclusion, Distributed Transactions, Deadlocks | **8** |
| 5 | Consistency and Replication | Introduction, Data-Centric Consistency Models, Client Centric Consistency Models, Distributed Protocols | **8** |
| 6 | Distributed Technologies and Frameworks | Overview of EJB S/W Architecture, view of EJB Conversation, Building and Deploying EJB, Roles in EJB, Types of Enterprise Beans, Lifecycle of Beans , Developing Applications using EJB Framework. | **5** |

| | | | |
|---|---|---|---|
| | | Introduction to CORBA, CORBA Components and architecture, Method Invocation, Static and Dynamic Invocation in CORBA, CORBA IDL, Developing Application using CORBA | **4** |
| | | Introduction to .NET, .NET architecture, . NET Remoting | **3** |
| | | Comparison of RMI, CORBA, EJB, .NET | **1** |
| 7. | Service Oriented Architecture | Defining SOA, Business value of SOA, SOA characteristics, Concept of a service, SOA Architecture, Deploying SOA applications. | **3** |

**Text Books:**


- Sunita Mahajan, Seema Shah, " Distributed Computing", Oxford, second edition.
- Andrew S. Tanenbaum & Maarten van Steen " Distributed Systems : Principles and paradigms" Prentice Hall of India Private Limited
- G. Sudha Sadasivam, Radha Shankarmani, "Middleware and Enterprise Integration Technologies " , Wiley Precise Textbook


**References:**


1. Pradeep K. Sinha "Distributed Operating Systems", Prentice Hall of India Private Limited
2. Thomas Erl "Service Oriented Architecture : Concepts, Technology and Design" Prentice Hall
3. G. Coulouris, J. Dollimore and T. Kindberg "Distributed Systems :


**Term work: 25 marks**

Term work should consist of at least 10 practical experiments with 1 mini project and assignments covering the topics of the syllabus

Distribution of marks for term work shall be as follows:

| | |
|---|---|
| Laboratory work (10 Experiments) | 10 Marks |
| Mini Project | 05 Marks |
| Assignments | 05 Marks |
| Attendance | 05 Marks |

**Suggested Practical List :**

1. Client Server based program using RPC
2. Client Server based program using RMI
3. Implementation of Clock Synchronization (logical/physical)
4. Implementation of Election algorithm.
5. Implementation of Mutual Exclusion algorithms
6. Program multithreaded client/server processes.
7. Program to demonstrate process/code migration.
8. Write a distributed application using EJB
9. Write a program using CORBA to demonstrate object brokering.
10. Use .Net framework to deploy a distributed application.
11. Mini Project : For Eg. using SOA

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| TEITC603 | System And Web Security | 04 Hr/Week | 02 Hr/Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITC603 | System And Web Security | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives**

1. Understand the fundamental principles of access control models and techniques, authentication and secure system design
2. Apply methods for authentication, access control, intrusion detection and prevention
3. Identify and mitigate software security vulnerabilities in existing systems.
4. Understand the role of firewalls, IPSec, Virtual Private Networks and identity management, etc.
5. Understand Web Server vulnerabilities and their counter measures

**Course Outcomes:**

**Upon successful completion of the course the student will be able to:**

- Differentiate between authentication and authorization;
- Explain the basic idea behind access control and compare the various access control policies and models.

- Explain the need for security protocols in the context of use with Internet-based applications;
- Explain the basic idea behind firewalls and intrusion detection systems and how they work;
- Explain malicious software and typical software solutions used in dealing with viruses and worms;
- Understand and explain various issues related to program security and web security.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **Introduction to Computer Security** | Vulnerabilities, Threats and Attacks, Public Key Cryptography and Cryptanalysis, Knapsack cryptosystem | 04 |
| 2 | **Authentication** | Authentication Methods and Protocols, Password based authentication, Token Based Authentication, Biometric Authentication, Digital Certificates, X. 509 Directory Services, PKI, Needham Schroeder Authentication Protocol, Single sign on, Kerberos Authentication Protocol, Federated Identity Management. | 08 |
| 3 | **Access Control** | Access control Policies: DAC, MAC, RBAC, Access control Matrix, ACLs and Capability Lists, Multiple level security model: Biba and Bell La Padula Models, Multilateral security, Covert channel, CAPTCHA. | 06 |
| 4 | **Software security** | Software Flaws, Buffer Overflow, Incomplete Mediation, Race conditions, Malware: Viruses, Worms, Trojans, Logic Bomb, Bots, Rootkits, Miscellaneous Software Attacks: Salami attack, Linearization Attacks, Trusted Computing: Software reverse engineering, Digital Rights management | 08 |

| | | | |
|---|---|---|---|
| 5 | **Operating System Security** | Linux Security Model, File System Security, Linux Vulnerabilities, Windows Security Architecture, Windows Vulnerabilities | 04 |
| 6 | **Network Security** | Network security basics, TCP/IP vulnerabilities Layer wise: Packet Sniffing, ARP spoofing, port scanning, IP spoofing, TCP syn flood, DNS Spoofing, Internet Security Protocols: SSL, TLS, IPSEC, Secure Email and S/MIME, Denial of Service: Classic DOS attacks, Source Address spoofing, ICMP flood, SYN flood, UDP flood, Distributed Denial of Service, Defenses against Denial of Service Attacks.<br><br>Firewalls, Intrusion Detection Systems: Host Based and Network Based IDS, Honey pots. | 12 |
| 7 | **Web Security** | User Authentication and session management, Cookies, Secure HTTP, SQL Injection Techniques, Cross Site Scripting, Cross-Site Request Forgery, Session Hijacking and Management, Phishing and Pharming Techniques, Web Services Security. | 06 |

**Text Books**

1) Computer Security Principles and Practice, by William Stallings, Pearson Education.

2) Security in Computing by Charles P. Pfleeger , Pearson Education

3) Computer Security by Dieter Gollman, **3rd Edition,** Wiley India.

4) Cryptography and Network Security by Behrouz A. Forouzan, TATA McGraw hill.

**Reference Books**

1) Information security Principles and Practice by Mark Stamp, Wiley publication

2) OWASP TOP 10: https://www.owasp.org/index.php/Top_10_2013

3) Network security bible 2nd edition, Eric Cole, Wiley India.

**Term Work**: 25 Marks (Total marks) = 15 Marks (Experiment and Case Studies) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Suggested Practical List:**

1. Design and implement the RSA cryptosystem.
2. Implement Digital signature scheme using RSA.
3. Simulate the Buffer overflow attack.
4. Simulate the Salami attack.
5. Design and implement a program for adding passwords to a file. The program should be able to filter out weak passwords (based on dictionary words or variants) and store the strong passwords by creating a hash of user ID and password.
6. Study of a packet sniffer like wireshark, or tcpdump. Use this tool to capture and analyze data in packets.
7. Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc
8. Detect ARP spoofing using open source tool ARPWATCH
9. Install an IDS (e.g. SNORT) and study the logs.
10. Use of iptables in linux to create firewalls.
11. Implement a simple SQL injection attack.

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| TEITC604 | Data Mining and Business Intelligence | 04 Hr/Week | 02 Hr/Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITC604 | Data Mining and Business Intelligence | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

1. To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.
2. To enable students to effectively identify sources of data and process it for data mining.
3. To make students well versed in all data mining algorithms, methods, and tools.
4. Learning how to gather and analyse large sets of data to gain useful business understanding.
5. To impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business value from data.

**Course Outcomes: On successful completion of this course students should be able:**

1. Demonstrate an understanding of the importance of data mining and the principles of business intelligence
2. Able to prepare the data needed for data mining algorithms in terms of attributes and class inputs, training, validating, and testing files.
3. Implement the appropriate data mining methods like classification, clustering or association mining on large data sets.
4. Define and apply metrics to measure the performance of various data mining algorithms.
5. Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise apply the appropriate data mining technique, interpret and visualize the results and provide decision support.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **Introduction to Data Mining** | What is Data Mining; Kind of patterns to be mined; Technologies used; Major issues in Data Mining | **02** |
| 2 | **Data Exploration** | Types of Attributes; Statistical Description of Data; Data Visualization; Measuring similarity and dissimilarity. | **04** |
| 3 | **Data Preprocessing** | Why Preprocessing? Data Cleaning; Data Integration; Data Reduction: Attribute subset selection, Histograms, Clustering and Sampling; Data Transformation & Data Discretization: Normalization, Binning, Histogram Analysis and Concept hierarchy generation. | **04** |
| 4 | **Classification** | Basic Concepts;<br>**Classification methods**:<br>1. Decision Tree Induction: Attribute Selection Measures, Tree pruning.<br>2. Bayesian Classification: Naïve Bayes' Classifier.<br>**Prediction**: Structure of regression models; Simple linear regression, Multiple linear regression.<br>**Model Evaluation & Selection: A**ccuracy and Error measures, Holdout, Random Sampling, Cross Validation, Bootstrap; Comparing Classifier performance using ROC Curves.<br>**Combining Classifiers**: Bagging, Boosting, Random | **08** |

| | | | |
|---|---|---|---|
| | | Forests. | |
| 5 | **Clustering** | Cluster Analysis: Basic Concepts;<br>**Partitioning Methods**: K-Means, K-Mediods;<br>**Hierarchical Methods**: Agglomerative, Divisive, BIRCH;<br>**Density-Based Methods:** DBSCAN, OPTICS | **08** |
| 6 | **Outlier Analysis** | What are outliers? Types, Challenges;<br>**Outlier Detection Methods:** Supervised, Semi-Supervised, Unsupervised, Proximity based, Clustering Based. | **02** |
| 7 | **Frequent Pattern Mining** | Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules;<br>Frequent Pattern Mining, Efficient and Scalable Frequent Itemset Mining Methods, The Apriori Algorithm for finding Frequent Itemsets Using Candidate Generation, Generating Association Rules from Frequent Itemsets, Improving the Efficiency of Apriori,<br>A pattern growth approach for mining Frequent Itemsets;<br>Mining Frequent itemsets using vertical data formats; Mining closed and maximal patterns;<br>Introduction to Mining Multilevel Association Rules and Multidimensional Association Rules; From Association Mining to Correlation Analysis, Pattern Evaluation Measures; Introduction to Constraint-Based Association Mining. | **08** |
| 8 | **Business Intelligence** | What is BI? Effective and timely decisions; Data, information and knowledge; The role of mathematical models; Business intelligence architectures; Enabling factors in business intelligence project; Development of a business intelligence system; Ethics and business intelligence | **03** |
| 9 | **Decision Support System** | Representation of the decision-making process; Evolution of information systems; Definition of decision support system; Development of a decision support system. | **03** |
| 10 | **BI Applications** | Data mining for business Applications like Fraud Detection, Clickstream Mining, Market Segmentation, retail industry, telecommunications industry, banking & finance CRM etc | **06** |

**Text Books:**

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3nd Edition
2. G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", 1st Edition, Wiley India.
3. Business Intelligence: Data Mining and Optimization for Decision Making by Carlo Vercellis ,Wiley India Publications

**Reference Books:**

1. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education
2. Michael Berry and Gordon Linoff "Data Mining Techniques", 2nd Edition Wiley Publications.
3. Michael Berry and Gordon Linoff "Mastering Data Mining- Art & science of CRM", Wiley Student Edition
4. Vikram Pudi & Radha Krishna, "Data Mining", Oxford Higher Education.

**Oral Exam:**

An oral exam will be held based on the above syllabus.

**Term work**:

Assign a case study for group of 2/3 students and each group to perform the following experiments on their case-study; Each group should perform the exercises on a large dataset created by them.

**Suggested Practical List:**

1) 2 tutorials
    a) Solving exercises in Data Exploration
    b) Solving exercises in Data preprocessing
2) Use WEKA to implement the following Classifiers - Decision tree, Naïve Bayes, Random Forest;
3) Implementation of any one classifier using languages like JAVA;
4) Use WEKA to implement the following Clustering Algorithms – K-means, Agglomerative, Divisive;
5) Implementation of any one clustering algorithm using languages like JAVA;

6) Use Weka to implement Association Mining using – Apriori, FPM;
7) Detailed study of any one BI tool like Oracle BI, SPSS, Clementine, and XLMiner etc. (paper Assignment)
8) Business Intelligence Mini Project: Each group assigned one new case study for this; A BI report must be prepared outlining the following steps:

   a) Problem definition, Identifying which data mining task is needed

   b) Identify and use a standard data mining dataset available for the problem. Some links for data mining datasets are: WEKA site, UCI Machine Learning Repository, KDD site, KDD Cup etc.

   c) Implement the data mining algorithm of choice

   d) Interpret and visualize the results

   e) Provide clearly the BI decision that is to be taken as a result of mining.

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| TEITT605 | Advanced Internet Technology | 04 Hr/Week | 02 Hr/Week | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| TEITT605 | Advanced Internet Technology | 20 | 20 | 20 | 80 | 25 | 25 | --- | 150 |

**Course Objectives:**

1. To introduce the concept of Search Engine basics.
2. To enable students to determine SEO Objective and develop SEO plan prior to Site Development.
3. To make students well versed with HTML 5, CSS3 and Responsive Web Design.
4. Learning the characteristic of RIA – Web Mashup Eco System.

**Course Outcomes: On successful completion of this course students should be able:**

1. Develop Keyword Generation, Using Google Analytics etc.

2. To demonstrate Responsive Web Design.

3. To demonstrate Amazon/Google or yahoo mashup.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1. | Search Engine Optimization | Search Engine Basics<br><br>Algorithm based Ranking Systems – Determining Searcher Intent and Delivering Relevant, Fresh Content, Analyzing Ranking Factors, Using Advanced Search Techniques, Vertical Search Techniques, Country-Specific Search Engines<br><br>Determining SEO Objective and Finding Your Site's Audience – Setting SEO Goals and Objective, Developing SEO plans Perior to Site Deveopment - SEO for Rawtraffic;E-commerce Sales;Mindsahre/Branding; Direct Marketing; Reputation Management; Ideological Influence<br><br>Getting started SEO: Defining Your Site's Information Architecture, Auditing an Existing Site to identify SEO Problems, Identifying Current Server Statistic Software and Gaining Access – Dtermining Top competitors, Benchmarking Current Indexing Status, Current Rankings, Benchmarking Current Traffic Source and Volumes, Conduct SEO/Website SWOT analysis.<br><br>Keyword Genration – Creating Pages – Website Structure- Creating Content-Creating Communities-building Links-Using Google Analytics-Social Media Optimization-Creating Pay-per-click Campaigns-Optimizing PPC Campaigns through Quality Score optimization - Tracking Results and Measuring Success. | **20** |
| 2. | Responsive web design with HTML5 and CSS3 | Getting Started with HTML 5, CSS3 and Responsive Web Design. | **16** |

| | | | |
|---|---|---|---|
| | | Media Queries: Supporting Differing Viewports<br>Embracing Fluid Layout<br>HTML 5 for Responsive Design<br>CSS3: Selectors, Typography and color Modes<br>Stunning Aesthetics with CSS3<br>CSS3 Transitions, Transformations and Animations<br>Conquer Forms HTML5 and CSS3 | |
| 3. | RIA and Mashup | Characteristic of RIA – Web Mashup Eco Systems – Mashup Techniques :1) Mashing on the Web Server, Rich User Interface using Ajax, Mashing with JSON<br>RIA: Ajax vs Traditional Approach<br>Technical Background:<br>1) Javascript and AJAX<br>2) JSON Alternative to XML<br>3) Syndication<br>4) REST and WS * Web Services | **12** |

**Text Books:**

1. Professional Web 2.0 Programming WROX press
2. Responsive Web Design with HTML5 and CSS3 PACKT
3. The Art of SEO O'Reilly Publication

**References:**

1. Rich Internet Application AJAX and Beyond WROX press
2. Web Technology, Srinivasan, Pearson

**Term Work**: 25 Marks (Total marks) = 15 Marks (Experiment and Case Studies) + 5 Marks (Assignments) + 5 Marks (Attendance)

**Suggested Practical List:**

1) Practical on SEO (Keyword Generation, Using Google Analytics etc.)

2) Practical to demonstrate Responsive Web Design

3) Practical to demonstrate Amazon/Google or yahoo mashup

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.
5. Weightage of marks should be proportional to number of hours assigned to each module.

# UNIVERSITY OF MUMBAI

## Bachelor of Engineering

**Information Technology (Second Year – Sem.VII & VIII)**

**Revised course (REV- 2012)**

**From Academic Year 2015 -16**

**Under**

## FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)

## From Dean's Desk:

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

Faculty of Technology, University of Mumbai, in one of its meeting unanimously resolved that, each Board of Studies shall prepare some Program Educational Objectives (PEO's) and give freedom to affiliated Institutes to add few (PEO's) and course objectives and course outcomes to be clearly defined for each course, so that all faculty members in affiliated institutes understand the depth and approach of course to be taught, which will enhance learner's learning process. It was also resolved that, maximum senior faculty from colleges and experts from industry to be involved while revising the curriculum. I am happy to state that, each Board of studies has adhered to the resolutions passed by Faculty of Technology, and developed curriculum accordingly. In addition to outcome based education, semester based credit and grading system is also introduced to ensure quality of engineering education.

Semester based Credit and grading system enables a much-required shift in focus from teacher-centric to learner-centric education since the workload estimated is based on the investment of time in learning and not in teaching. It also focuses on continuous evaluation which will enhance the quality of education. University of Mumbai has taken a lead in implementing the system through its affiliated Institutes and Faculty of Technology has devised a transparent credit assignment policy and adopted ten points scale to grade learner's performance. Credit assignment for courses is based on 15 weeks teaching learning process, however content of courses is to be taught in 12-13 weeks and remaining 3-2 weeks to be utilized for revision, guest lectures, coverage of content beyond syllabus etc.

Credit and grading based system was implemented for First Year of Engineering from the academic year 2012-2013. Subsequently this system will be carried forward for Second Year Engineering in the academic year 2013-2014, for Third Year and Final Year Engineering in the academic years 2014-2015 and 2015-2016 respectively.

**Dr. S. K. Ukarande**
**Dean,**
**Faculty of Technology,**
**Member - Management Council, Senate, Academic Council**
**University of Mumbai, Mumbai**

## Preamble

The engineering education in India in general is expanding in manifolds. Now, the challenge is to ensure its quality to the stakeholders along with the expansion. To meet this challenge, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education and reflects the fact that in achieving recognition, the institution or program of study is committed and open to external review to meet certain minimum specified standards. The major emphasis of this accreditation process is to measure the outcomes of the program that is being accredited. Program outcomes are essentially a range of skills and knowledge that a student will have at the time of graduation from the program. In line with this Faculty of Technology of University of Mumbai has taken a lead in incorporating philosophy of outcome based education in the process of curriculum development.

I, as Chairman, Board of Studies in Information Technology of University of Mumbai, happy to state here that, Program Educational Objectives were finalized in a meeting where more than 30 members from different Institutes were attended, who were either Heads or their representatives of Information Technology Department. The Program Educational Objectives finalized for undergraduate program in Information Technology are listed below;

1. To prepare Learner's with a sound foundation in the basics of engineering fundamentals.
2. To prepare Learner's to use effectively modern programming tools to solve real life problems.
3. To prepare Learner's for successful career in Indian and Multinational Organisations and to excel in Postgraduate studies
4. To encourage and motivate Learner's for entrepreneurship.
5. To inculcate professional and ethical attitude, good leadership qualities and commitment to social responsibilities in Learners.
6. To encourage Learner to use best practices and implement technologies to enhance information security and enable compliance, ensuring confidentiality, information integrity, and availability.

In addition to Program Educational Objectives, for each course of undergraduate program, objectives and expected outcomes from learner's point of view are also included in the curriculum to support the philosophy of outcome based education. I believe strongly that small step taken in right direction will definitely help in providing quality education to the stake holders.

**Dr. J. W. Bakal**
**Chairman, Board of Studies in Information Technology,**

# B.E. Engineering (Semester VII)
# Revised course for Information Technology
# Academic Year 2015 -16 (REV- 2012)

| Course Code | Course Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Prac | Tut. | Total |
| BEITC701 | Software Project Management | 4 | | | 4 | | | 4 |
| BEITC702 | Cloud Computing | 3 | | | 3 | | | 3 |
| BEITC703 | Intelligent System | 4 | | | 4 | | | 4 |
| BEITC704 | Wireless Technology | 4 | | | 4 | | | 4 |
| BEITC705 | Elective - I | 4 | | | 4 | | | 4 |
| BEITL701 | Software Project Management | | 2 | | | 1 | | 1 |
| BEITL702 | Cloud Computing | | 2 | | | 1 | | 1 |
| BEITL703 | Intelligent System | | 2 | | | 1 | | 1 |
| BEITL704 | Wireless Technology | | 2 | | | 1 | | 1 |
| BEITT705 | Elective - I | | 2 | | | 1 | | 1 |
| BEITP706 | Project-I | | * | | | 3 | | 3 |
| | Total | 19 | 10 | | 19 | 08 | | 27 |

***Work load of the teacher in semester VII is equivalent to 6 hrs/week.**

| Elective –I ( Semester VII) | |
|---|---|
| BEITC7051 | Image Processing |
| BEITC7052 | Software Architecture |
| BEITC7053 | E-Commerce & E-Business |
| BEITC7054 | Multimedia Systems |
| BEITC7055 | Usability Engineering |
| BEITC7056 | Ubiquitous Computing |

## Examination Scheme

| Course Code | Course Name | Theory | | | | | Term work | Pract/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Internal Assessment | | | End sem exam | Exam duration (in Hrs) | | | |
| | | TEST 1 | TEST 2 | AVG. | | | | | |
| BEITC701 | Software Project Management | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC702 | Cloud Computing | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC703 | Intelligent System | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC704 | Wireless Technology | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC705 | Elective - I | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITP706 | Project-I | | | | | | 25 | 25 | 050 |
| | Total | 100 | 100 | 100 | 400 | 15 | 150 | 150 | 800 |

## B.E. Engineering (Semester VIII)
## Revised course for Information Technology from
## Academic Year 2015 -16, (REV- 2012)

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
| BEITC801 | Storage Network Management and Retrieval | 4 | | | 4 | | | 4 |
| BEITC802 | Big Data Analytics | 4 | | | 4 | | | 4 |
| BEITC803 | Computer Simulation and Modeling | 4 | | | 4 | | | 4 |
| BEITC804 | Elective -II | 4 | | | 4 | | | 4 |
| BEITL801 | Storage Network Management and Retrieval | | 2 | | | 1 | | 1 |
| BEITL802 | Big Data Analytics | | 2 | | | 1 | | 1 |
| BEITL803 | Computer Simulation and Modeling | | 2 | | | 1 | | 1 |
| BEITL804 | Elective -II | | 2 | | | 1 | | 1 |
| BEITP805 | Project - II | | ** | | | 6 | | 6 |
| | Total | 16 | 08 | | 16 | 10 | | 26 |

****Workload of the teacher in semester VIII is equivalent to 12 hrs/week.**

| Elective –I I ( Semester VIII) | |
|---|---|
| BEITC8041 | Enterprise Resource Planning |
| BEITC8042 | Wireless Sensor Networks |
| BEITC8043 | Geographical Information Systems |
| BEITC8044 | Robotics |
| BEITC8045 | Soft Computing |
| BEITC8046 | Software Testing & Quality Assurance |

## Examination Scheme

| Course Code | Course Name | Theory | | | | | Term work | Pract/ Oral | Total |
|---|---|---|---|---|---|---|---|---|---|
| | | Internal Assessment | | | End sem exam | Exam duration (in Hrs) | | | |
| | | TEST 1 | TEST 2 | AVG. | | | | | |
| BEITC801 | Storage Network Management and Retrieval | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC802 | Big Data Analytics | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC803 | Computer Simulation and Modeling | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITC804 | Elective -II | 20 | 20 | 20 | 80 | 3 | 25 | 25 | 150 |
| BEITP805 | Project - II | | | | | | 50 | 50 | 100 |
| | Total | 80 | 80 | 80 | 320 | 12 | 150 | 150 | 700 |

| Course Code | Course Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC701 | Software Project Management | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC701 | Software Project Management | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

This course will help students to identify key areas of concern over Project Life Cycle (PLC) and use of project management principles across all the phases of PLC. The course will also help student to make them understand the importance and necessity of project plan and how it is helpful to project manager in monitoring and controlling the various aspects of the project such as schedule, budget, etc. The course will make them understand the importance of team and how to work as a team member, share best project management practices.

**Course Outcomes:**

Upon completion of the course, students should be able to:

- Articulate similarities and differences between IT projects and other types of projects.
- Justify an IT project by establishing a business case
- Develop a project charter
- Develop a work breakdown structure for an IT project

- Estimate resources (time, cost, human being, etc.)
- Establish task inter-dependencies
- Construct and analyze a network diagram
- Identify IT project risks and develop risk mitigation strategies
- Ensure the quality of the project using various standards
- Demonstrate Team work and team spirit and how to overcome the conflicts

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **An overview of IT Project Management** | Introduction, the state of IT project management, context of project management, need of project management, project goals, project life cycle and IT development, information technology project methodology (ITPM), project feasibility, request for proposal (RFP), the business case, project selection and approval, project contracting, PMBOK. | 4 |
| 2 | **Project Integration Management** | Introduction, project management process, project integration management, the project charter, project planning framework, the contents of a project plan, the planning process. | 4 |
| 3 | **Project Scope Management** | Introduction, scope planning, project scope definition, project scope verification, scope change control, the Work Breakdown Structure (WBS), the linear responsibility chart. | 4 |
| 4 | **Project Time Management** | Introduction, developing the project schedule, Scheduling Charts, logic diagrams and network (AOA, AON), critical path, calendar scheduling and time based network, management schedule reserve, PDM network, PERT, CPM, Resource loading, resource leveling, allocating scarce resources to projects and several projects, Goldratt's critical chain. | 10 |
| 5 | **Project Cost Management** | Cost estimating, Cost escalation, Cost estimating and system development cycle, Cost estimating process, Elements of budgets and estimates, Project cost accounting and MIS, Budgeting using cost accounts, Cost schedules and forecasts. | 4 |

| | | | |
|---|---|---|---|
| 6 | **Project Quality Management** | Introduction, Quality tools and philosophies, quality systems, the IT project quality plan. | 3 |
| 7 | **Project Human Resource Management** | Introduction, organization and project planning, the project team, multidisciplinary teams, the project environment, project leadership, ethics in projects, multicultural projects, Role of project manager, IT governance and the project office.<br>Introduction to change, the nature of change, the change management plan, dealing with resistance and conflicts. | 5 |
| 8 | **Project Communication Management** | Introduction, monitoring and controlling the project, the project communications plan, project metric, project control, designing the control system, the plan-monitor-control cycle, data collection and reporting, reporting performance and progress, information distribution. | 4 |
| 9 | **Project Risk Management** | Basic concepts, Identification, Assessment, Response planning, Management. | 4 |
| 10 | **Project Procurement Management** | Introduction, project procurement management, outsourcing. | 3 |
| 11 | **The Implementation Plan and Project Closure** | Introduction, project implementation, administrative closure, project evaluation, project audit. | 3 |

**Text Books:**


1. Jack T. Marchewka, Information Technology Project Management, 4th edition, Wiley India, 2009.
2. John M. Nicholas, Project Management for Business and Technology, 3rd edition, Pearson Education.


**References:**


1. E-Book - Project Management Body of Knowledge (PMBOK).
2. Claudia M. Baca, Patti M. Jansen, PMP: Project Management Professional Workbook, Sybex Publication.
3. S. J. Mantel, J. R. Meredith and etal., Project Management 1st edition, Wiley India, 2009.
4. Joel Henry, Software Project Management, A real-world guide to success, Pearson Education, 2008.
5. Gido and Clements, Successful Project Management, 2nd edition, Thomson Learning

6. Hughes and Cornell, Software Project Management, 3rd edition, Tata McGraw Hill
7. Joseph Phillips, IT Project Management, end edition, Tata McGraw Hill
8. Robert K. Wyzocki, Effective Project Management, 5th edition, Wiley
9. Brown, K.A. Project Management, McGraw Hill, 2002.
10. Dinsmore, P. C. (Ed.), The AMA Handbook of Project Management. AMACOM, 1993.

**Term work:**

Term work shall consist of at least 10 experiments covering all topics of the syllabus. Distribution of marks for term work shall be as follows:
1. Attendance (Theory and Practical): 05 Marks
2. Laboratory work (Experiments and Journal): 15 Marks
3. Assignments: 5 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

**Suggested Practical List:**

In practical, a group of maximum **three** students should be formed. Each group is supposed to complete all lab experiments (given below) on the case study given by the subject teacher. In lab experiments, students can used the tools like MsWord to prepare document whereas MsProject for preparing WBS, N/w diagram, PERT, CPM, performance analysis of the project, etc.

1. Project and System's Management
2. Feasibility study
3. Project Proposal
4. Project Planning
5. Activity Planning
6. Analyzing the project network diagram
7. Cost estimation and budgeting
8. Risk management
9. Performance analysis of project
10. Project evaluation and closure

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC702 | Cloud Computing | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC702 | Cloud Computing | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

This course will help the students to get familiar with cloud computing fundamentals, architecture, services, implementation and deployment techniques etc.

**Course Outcomes:**

After completion of the course the learner should be able to:

1. Differentiate different computing techniques.

2. Compare various cloud computing providers/ Software.

3. Handle Open Source Cloud Implementation and Administration.

4. Understand risks involved in cloud computing.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1. | Introduction to Cloud Computing | - Introduction – Component of CC – Comparing CC with Virtualization, Grids, Utility Computing, client-server model, P-to-P Computing – Impact of CC on Business – Key Drivers for Cloud Computing - Cloud computing Service delivery model<br>- Cloud Types – Private, Public and Hybrid, when to avoid public cloud, Cloud API | **2** |
| 2. | Virtualization | - Introduction & benefit of Virtualization – Implementation Levels of Virtualization- VMM Deisgn Requirements and Providers – Virtualization at OS level – Middleware support for Virtualization – Virtualization structure/tools and mechanisms: Hypervisor and Xen Architecture, Binary Translation with full Virtualization, Para Virtualization with Compiler Support –<br>- Virtualization fo CPU, Memory and I/O Devices, Hardware support for Virtualization in intel x86 processor – CPU Virtualization – Memory Virtualization and I/O Virtualization – Virtualization in Multicore processors | **4** |
| 3. | Cloud computing Services | XaaS, IaaS, PaaS- Leveraging PaaS for Productivity- Languages for PaaS- DBaaS(Database as a services) – SaaS (Software as a service) – Comparison of various cloud computing providers/ Softwares. | **4** |
| 4. | Cloud Computing and Business Value | Key Business Drivers for CC- Cloud computing and out sourcing – Types of Scalability – Security issues in Cloud Computing- time to Market Benefits- Distribution over Internet – Three levels of Business value from Cloud computing. | **4** |
| 5. | Open Source Cloud Implementation and Administration | Eucalyptus and Open Stack Architecture Features – Components – Various mode of operations – Installation and configuration process of both open source – Cloud Administration and Management Task – Creating User Interface ( Web Interface ) of Private cloud. | **6** |

| | | | |
|---|---|---|---|
| 6. | Cloud Deployment Techniques | Factors for Successful Cloud Deployment – Network Requirements – Potential Problem areas in a cloud Network and their Mitigation – Cloud Network Topologies – Automation and Self-service feature in a cloud –cloud performance. | **4** |
| 7. | Security | Security for Virtualization Platform – Host security for SaaS, PaaS and IaaS – Data Security – Data Security Concerns – Data Confidentiality and Encryption – Data Availability – Data Integrity – Cloud Storage Gateways – Cloud Firewall | **4** |
| 8. | Architecture for Cloud Application | Cloud Application requirements- Architecture for traditional Vs Cloud Applications- Multi-ties Application Architecture- SOA for Cloud applications – Resource oriented SOA – Method –oriented SOA and Event Driven SOA – Parallelization within Cloud Applications – Leveraging In-memory Operations for Cloud Application | **4** |
| 9 | Cloud Programming | Programming Support for Google Apps engine: GFS, Big Tables, Googles NO SQL System, Chubby, Google Distibuted Lock Service,<br><br>Programming Support for Amazon EC2: Amazon S3, EBS and Simple DB etc. | **4** |
| 10 | Adoption and Use of Cloud | Adoption of Public cloud by SMBs- Public Cloud Adoption phase for SMBs- Vendor liability and Management<br><br>Adoption process of Public clouds by Enterprises – Managed Private clouds<br><br>Migrating Application to the cloud – Impact of Shared Resources and Multi-Tenancy on cloud Applications – Phases during Migration an Application to An IaaS Cloud | **4** |
| 11 | Risks of Cloud Computing and Related Costs | Risk Assessment and Management – Rosk of Vendor Lock-in – Risk of Loss of control over IT services- Risk of Poor Provisioning – Risk of Multi-tenant environment – Risk failure of cloud provider – SLA risk –security, malware and Internet Attacks – Risk with Application Licensing. | **2** |
| 12 | AAA Administration for Clouds | AAA model – SSO for Clouds – Authentication management and Authorization management in clouds – Accounting for Resource utilization. | **2** |

| | | | |
|---|---|---|---|
| 13 | Security as a service | What can security as service offer- Benefits for Security as a service – Issues with Security as a Service- Identity Management as a Service | **2** |
| 14 | Mobile Cloud Computing | Introduction, Defination, Architecture, Benefits, challenges in mobile and at cloud shield | **2** |

**Text Books:**

1. Cloud Computing Principles and Paradigms, Rajkumar Buyya Wiley

2. Distributed and Cloud Computing, Kai Hwang, Mk Publication

3. Cloud computing Black Book Dreamtech Publication

**References:**

1. Using Goolgle Apps engine O'reilly Publication

2. Programming Amazon EC2, O'reilly Publication

3. Cloud security, Ronald L. Wiley Publication

4. Cloud computing Dr. Kumar Saurabh, wily Publication

5. Virtualization for Dummies, Wiley Publication

**Term work:**

**Suggested Practical List (If Any):**

1. Implementation of Private cloud using Eucalyptus or Open stake

    - Working with KVM to create VM

    - Installation and configuration of Private cloud

    - Bundling and uploading images on a cloud

    - Creating web based UI to launch VM

    - Working with Volumes – Attached to the VM

2. Programming using Google Apps engine and Pythone

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC703 | Intelligent System | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC703 | Intelligent System | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

1. To introduce the students' with different issues involved in trying to define and simulate intelligence.
2. To familiarize the students' with specific, well known Artificial Intelligence methods, algorithms and knowledge representation schemes.
3. To introduce students' different techniques which will help them build simple intelligent systems based on AI/IA concepts.

**Course Outcomes:**

1. Students will develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents.
2. Students will be able to choose an appropriate problem-solving method and knowledge-representation scheme.
3. Students will develop an ability to analyze and formalize the problem (as a state space, graph, etc.) and select the appropriate search method.
4. Students will be able to develop/demonstrate/ build simple intelligent systems or classical toy problems using different AI techniques.

**DETAILED SYLLABUS**

| Module | Detailed Content | Hours |
|---|---|---|
| 1 | **Introduction:** Introduction to AI, AI Problems and AI techniques, Solving problems by searching, Problem Formulation. | 04 |
| 2 | **Intelligent Agents:** Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. | 03 |
| 3 | **Uninformed Search Techniques:** DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Comparing Different Techniques. | 04 |
| 4 | **Informed Search Methods**: Heuristic functions, Hill Climbing, Simulated Annealing, Best First Search, A*, IDA*, SMA*, Crypto-Arithmetic Problem, Backtracking for CSP, Performance Evaluation. | 08 |
| 6 | **Adversarial Search:** Game Playing, Min-Max Search, Alpha Beta Pruning. | 03 |
| 7 | **Knowledge and Reasoning:** A Knowledge Based Agent, WUMPUS WORLD Environment, Propositional Logic, First Order Predicate Logic, Forward and Backward Chaining, Resolution. , Introduction to PROLOG. | 08 |
| 8 | **Planning**: Introduction to Planning, Planning with State Space Search, Partial Ordered planning, Hierarchical Planning, Conditional Planning, Planning with Operators. | 04 |
| 9 | **Uncertain Knowledge and Reasoning:** Uncertainly, Representing Knowledge in an Uncertain Domain, Conditional Probability, Joint Probability, Bays theorem, Belief Networks, Simple Inference in Belief Networks. | 06 |
| 10 | **Learning:** Learning from Observation, General Model of Learning Agents, Inductive Learning, Learning Decision Trees, Rote Learning, Learning by Advice, Learning in Problem Solving, Explanation based Learning | 05 |
| 11 | **Expert Systems:** Representing and using Domain Knowledge, Expert System-shell, Explanation, Knowledge Acquisition | 03 |

**Text Books:**


1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education.
2. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition.
3. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 2nd Edition.

**Reference Books:**


1. George Lugar, .AI-Structures and Strategies for Complex Problem Solving., 4/e, 2002, Pearson Education.
2. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education.
4. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication


**Term work:**

Term Work shall consist of at least 8 practical and 2 assignments based on the list given below:

**Suggested Practical:**

1. Implementing Water jug problem using 1. BFS. , 2. DFS ( Un-Informed Search)
2. Implementing 8 puzzle problem with Heuristic function using Hill Climbing. ( Informed Search )
3. Implementing 8 puzzle problem with Heuristic function – Best First Search ( Informed Search )
4. Implementing 8 Queen Problem with Heuristic function ( Informed Search )
5. Implementing Tic-Tac-Toe problem to demonstrate Min – Max and Alpha Beta Pruning. ( Adversarial Search )
6. Implementing WUMPUS world problem. ( Knowledge and Reasoning )
7. Introduction to PROLOG – solving Basic problems like Factorial, Fibonacci series, Implementing User Defined String functions etc. ( PROLOG )
8. Implementing Family Information System ( PROLOG )
9. Implementing Mini Expert system. ( PROLOG )

(Note: List of experiments is not limited with the above list , teacher can choose different set of experiments but care should be taken to explore variety of topics. )

**Term Work: 25 Marks (total marks) = 15 Marks (Experiment) + 5 Marks (Assignment) + 5Marks (Attendance (theory + practical))**

**Oral examination** is to be conducted based on the complete syllabus.

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BE ITC704 | Wireless Technology | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC 704 | Wireless Technology | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

Get acquainted with modern wireless communication networks. Evolution of cellular networks, to understand basic framework of various protocols and standards used to develop wireless personal and wide area networks

**Course Outcomes:**

1. Understand the new trends in mobile/wireless communications networks
2. Understand the characteristics of mobile/wireless communication channels
3. Understand the multiple radio access techniques
4. Understand the multiuser detection techniques
5. Understand various wireless networks and their technologies
6. Understand need of securities and economies in wireless systems

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | Fundamentals of wireless Communication | • Fundamentals of Wireless Communication Advantages, Limitations and Applications<br>• Wireless Media<br>• Infrared Modulation Techniques<br>• DSSS And FHSS<br>• Multiple access technique: TDMA,CDMA, FDMA, CSMA,OFDMA [ fundamentals]<br>• Frequency Spectrum<br>• Radio and Infrared Frequency Spectrum | **08** |
| 2 | Wireless technology | • The cellular concepts: Frequency Reuse, Channel assignment strategies, Handoff strategies Interference and System Capacity [Design problems]<br>• Evolution of cellular networks 1G, 2G,3G,4G<br>•GSM: System Architecture, Radio Subsystem, Channel Types, GSM frame structure<br>• CDMA: Architecture, Frequency and channel specifications, forward and Reverse CDMA Channels. | **10** |
| 3 | Wire less in local loop (WLL) | User requirements of WLL systems, WLL system architecture, MMDS, LMDS, WLL subscriber terminal, WLL interface to the PSTN | **04** |
| 4 | Wire less local area networks (WLAN) | Introduction, WLAN Equipment, WLAN topologies and Technologies, IEEE 802.11 WLAN : Architecture, Physical Layer, Data Link Layer , MAC Layer, Security Latest developments of IEEE 802.11 standards | **08** |
| 5 | Wireless personal area netwoks (WPAN) | Introduction ,WPAN technologies and Protocols,<br>Bluetooth (802.15.1)[ Protocol stack and network connection establishment, security aspects]<br>HR –WPAN ( UWB) ( IEEE 802.15.3 )<br>LR-WPAN ( IEEE 802.15.4 ) Zigbee [ Stack architecture, components , Network Topologies , Applications]<br>Wireless Sensor networks [ Network model and protocol stack , | **08** |

| | | | |
|---|---|---|---|
| | | routing algorithms, Applications ] | |
| 6 | Wireless metropolitan area networks | IEEE 802.16 [ Protocol Architecture],<br>IEEE 802.16a [Wimax]<br>Wimax and LTE /3GPP comparison | **04** |
| 7 | Security issues in Wireless Systems | The need, attacks , security services, wired equivalent privacy protocol(WEP), Mobile IP, VPN [ PPTP, L2TP, IPSec] | **03** |
| 8 | Economies of Wireless Network | Economic Benefits, Economics of Wireless industry Wireless data forecast, charging issues | **03** |

**Text Books:**

1. Modern wireless communication systems: by Simon Haykin, Michael Moher, adapted by David Koilpillai ; Pearson (Indian edition 2011)
2. Wireless Networks: by Nicopolitidia, M S Obaidat, GI Papadimitriou; Wiley India (student edition 2010)
3. Wireless communications: by T L Singal; Tata McGraw Hill Education private Ltd.( edition 2011)

**References:**

1. Wireless and Mobile Networks: Dr. Sunilkumar S. Manvi & Mahabaleshwar S. Kakkasageri
2. Wireless Communications and Networking: by Vijay K. Garg
3. Wireless Communications: by Theodore S. Rappaport

**Term work:** Students are asked to perform lab sessions using Ns-2 Simulator and Matlab platform.

Assignments should be given based on syllabus.

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (hrs/week) | Credits Assigned |
|---|---|---|---|

| | | Theory | Pract. | Tut. | Theory | TW/Pract | Tut. | Total |
|---|---|---|---|---|---|---|---|---|
| BEITC7051 | Image Processing | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | CourseName | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | TW | Pract. | Oral | Total |
| | | Internal Assessment | | | End Semester Exam | | | | |
| BEITC7051 | Image Processing | Test 1 | Test 2 | Average of Test1 & Test2 | | | | | |
| | | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Pre-requisite:** As images are two dimensional signals, the single dimensional Digital Signal Processing fundamentals are part of the prerequisite study.

**Objective:** One picture is worth thousand words. A course in digital image processing teaches how such visual information can be used in various applications. This course will introduce the basic ideas and techniques used for processing images and their popular applications.
The objectives of this course are:

- To cover the basic theory and algorithms that are widely used in digital image processing,
- To expose students to current technologies and issues that are specific to image processing systems
- To develop skills in using computers to process images.

**Outcome:** Students should demonstrate the ability:

- To understand the fundamental concepts of a digital image processing system,
- To make extensive use of these concepts in implementing processing techniques such as noise removal, enhancement, compression for efficient storage and transmission, object extraction, representation and description for recognition or building computer vision, etc.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours | Weightage of marks |
|---|---|---|---|---|
| 0 | Introductions to Signal Processing Only as a prerequisite for Image Processing. Hence not part of theory exam. | Analog, discrete and digital signals, 1D, 2-D signals with examples. Discrete time signals: sequences, Discrete time systems LTI systems and their properties. Convolution and Correlation- need, methods and examples | 04 | 0% |
| 1 | Introduction to digital image processing | Introduction: Definition of digital image, generation of digital image, steps in digital image processing, 2D sampling, spatial and tonal resolutions, pixel connectivity, elements of digital image processing systems | 05 | 10% |
| 2 | Image enhancement in the spatial domain | Point operations, histogram processing, spatial filtering: smoothing, sharpening, median, highboost | 07 | 20% |
| 3 | Two Dimensional Discrete Fourier Transform | Introduction to image in frequency domain, Concept of basis images, two dimensional D.F.T. and its properties, two dimensional F.F.T. Filtering in the frequency domain: smoothening, sharpening and homomorphic filtering. | 06 | 15% |
| 4 | Image segmentation | Detection of discontinuities, edge linking and boundary detection, Hough transform, thresholding, region oriented segmentation. | 06 | 10% |
| 5 | Image representation and description | Boundary descriptors: shape number, Fourier descriptor, statistical moments; regional descriptors | 06 | 10% |
| 6 | Image data compression | Image data redundancies: coding, inter-pixel, psychovisual; Fundamentals of lossless compression : Arithmetic coding, Huffman coding, LZW coding, RLE, Bit plane coding, predictive coding<br>Lossy compression : JPEG, Subband coding, Vector quantization, Image compression standard, Fidelity criteria | 06 | 15% |
| 7 | Image morphology | Morphological operation : Dilation erosion, Opening & Closing, Hit or Miss Transform, Basic Morphological Algorithms | 04 | 10% |

| | | | | |
|---|---|---|---|---|
| 8 | Applications of image processing | Case Study on the following applications: Digital watermarking, Biometric authentication (face, finger print, signature recognition), Vehicle number plate detection and recognition, Content Based Image Retrieval, Text Compression. | 04 | 10% |

**Text Books:**

1. Gonzalez & Woods, Digital Image Processing, Pearson Education, Third Edition.
2. W. Pratt, Digital Image Processing, Wiley Publication, Fourth Edition, 2013.

**Reference Books:**

1. J. G. Proakis and D. G. Manolakis, Digital Signal processing Principals,Algorithms and Applications,PHI publications, Third edition,
2. Milan Sonka , Digital Image Processing and Computer Vision, Thomson publication, Second Edition.2007.
3. A.K. Jain, Fundamentals of Image processing, Prentice Hall of India Publication, 1995
4. Gonzalez & Woods, Digital Image Processing using MATLAB, Pearson Education
5. S.Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Processing ,McGraw Hill Education (India) Private Limited, New Delhi, 2009.
6. S.Sridhar, Digital Image Processing ,Oxford University Press, New Delhi, 2011.

**Term work:**

At least 08 experiments covering entire syllabus must be performed during the semester and it should be presented in the practical record. Term work assessment must be based on the overall performance of the student with every practical graded from time to time. The grades should be converted into marks as per the Credit and Grading System manual and should be added and averaged. Due weightage should be given for the student's attendance.

**Internal Assessment (IA):**

Two tests must be conducted which should cover at least 80% of syllabus. The average marks of both the tests shall be considered as final IA marks

**Suggested Practical List:**

A minimum of 8 experiments from the suggested list must be performed. The DSP experiments (experiment 1 and 2 ) are the prerequisites.

1. Write a MATLAB program or C++ program for generating the following discrete time signals:
    a. Exponential signal
    b. Unit step and unit ramp signals
    c. Sinusoidal signal
    d. Composite signal with minimum 3 sinusoids added
2. Write a MATLAB program to demonstrate convolution and correlation operations with different examples of discrete time sequences.
3. Write a program for the following point processing operations and compare the results with MATLAB built in functions
    a. Image negative
    b. Gray level slicing with or without background
    c. Power law transformations
    d. Bit plane slicing
    e. Histogram equalization
4. Write a program for image enhancement and compare the results with MATLAB built in functions.
    a. Smoothing
    b. Sharpening
    c. High boost filtering
5. Write a program for image noise removal and analyze the results using,
    a. Averaging
    b. Median filter
6. Write a MATLAB program for 2D Discrete Fourier Transform and Inverse transform using built in functions.
7. Write a MATLAB PROGRAM for Transform domain processing using low pass and high pass filters and analyze the results for the following (any one):
    a. Ideal filter
    b. Butterworth filter
    c. Gaussian filter
8. Write a MATLAB PROGRAM for edge detection in 2 directions and compare the results with built in functions for the following operators (any one):
    a. Robert operator
    b. Prewitt operator
    c. Sobel operator
9. Write a MATLAB PROGRAM to compress the image using any one of the following lossless image compression techniques:
    a. Huffman
    b. RLE
    c. LZW
10. Write a MATLAB PROGRAM to compress the image using any one of the following

lossy image compression techniques:
    a. JPEG
    b. IGS
    c. Predictive coding
11. Write a MATLAB PROGRAM to perform the following basic and derived morphological operations:
    a. Dilation
    b. Erosion
    c. Opening
    d. Closing
    e. Boundary Detection
12. Write a MATLAB PROGRAM to represent / describe the image using any one of the following:
    a. Chain code / shape number
    b. Moments
    c. Fourier descriptors
    d. Euler number

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (hrs/week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| BEITC7052 | Software Architecture | Theory | Practical | Tutorial | Theory | Practical /Oral | Tutorial | Total |
| | | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC7052 | Software Architecture | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

- To provide students with a strong foundation in developing large, practical software-intensive applications.
- To train students with sound technical exposure to the concepts, principles, methods and best practices in software architecture.
- To develop the ability among students to learn the details of modeling techniques, design, implementation, deployment, and system adaptation.
- To enable students to choose the right tool for the job at hand and document design rationale.
- To prepare students to gain experiences with examples in design pattern application and case studies in software architecture.

**Course Outcomes:**

At the end of the course, students should be able to:

1. Argue the importance and role of software architecture.
2. Recognize major software architectural styles, design patterns, and frameworks.
3. Design software architecture for large scale software systems.
4. Describe various documentation approaches and architectural description languages.
5. Apply architectural patterns to quickly generate architectural alternatives and choose between them.

**Prerequisites:**

This course builds on the study of Object Oriented Software Engineering. We assume fluency with Object Oriented Languages and UML

**DETAILED SYLLABUS:**

| Sr. No | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **1** | **Basic Concepts**<br>1.1 Concepts of Software Architecture<br>1.2 Models.<br>1.3 Processes.<br>1.4 Stakeholders. | **03** |
| 2 | **2** | **Designing Architectures**<br>2.1 The Design Process.<br>2.2 Architectural Conception.<br>2.3 Refined Experience in Action: Styles and Architectural Patterns.<br>2.4 Architectural Conception in Absence of Experience.<br>2.5 Putting it all Together: Design Processes Revisited | **05** |
| 3 | **3** | **Connectors**<br>3.1 Connectors in Action: A Motivating Example.<br>3.2 Connector Foundations.<br>3.3 Connector Roles.<br>3.4 Connector Types and Their Variation Dimensions.<br>3.5 Example Connectors.<br>3.6 Using the connector Framework | **06** |
| 4 | **4** | **Modeling**<br>4.1 Modeling Concepts.<br>4.2 Ambiguity, Accuracy, and Precision.<br>4.3 Complex Modeling: Mixed Content and Multiple Views.<br>4.4 Evaluating Modeling Techniques.<br>4.5 Specific Modeling Techniques: Generic Techniques, Domain and Style specific ADLs, Extendable ADLs. | **04** |
| **5** | **5** | **Visualization**<br>5.1 Visualization Concepts.<br>5.2 Common issues in Visualization.<br>5.3 Visualization Techniques: Textual Visualization, UML, xADL. | **04** |
| **6** | **6** | **Analysis**<br>6.1 Analysis Goals.<br>6.2 Scope of Analysis. | **06** |

| | | | |
|---|---|---|---|
| | | 6.3 Architectural Concern being Analyzed.<br>6.4 Level of Formality of Architectural Models.<br>6.5 Type of Analysis.<br>6.6 Analysis Techniques. | |
| **7** | **7** | **Implementation and Deployment**<br>6.1 Concepts.<br>6.2 Existing Frameworks.<br>6.3 Software Architecture and Deployment.<br>6.4 Software Architecture and Mobility. | **04** |
| **8** | **8** | **Applied Architectures and Styles**<br>8.1 Distributed and Networked Architectures.<br>8.2 Architectures for Network-Based Applications.<br>8.3 Decentralized Architectures.<br>8.4 Service-Oriented Architectures and Web Services. | **08** |
| **9** | **9** | **Designing for Non-Functional Properties**<br>9.1 Efficiency.<br>9.2 Complexity.<br>9.3 Scalability and Heterogeneity.<br>9.4 Adaptability.<br>9.5 Dependability. | **04** |
| **10** | **10** | **Documentation**<br>10.1 Uses of Architectural Documentation.<br>10.2 Views<br>10.3 Choosing the Relevant Views<br>10.4 Documenting a View<br>10.5 Documentation across Views | **04** |

**Text Books:**


1. Richard N. Taylor, Nenad Medvidovic, Eric M. Dashofy, "Software Architecture: Foundations, Theory, and Practice", Wiley Publications.
2. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Pearson


**References:**


1. M. Shaw, "Software Architecture Perspectives on an Emerging Discipline", Prentice Hall.


**Term work:** Term work should be based on the Lab experiments and assignments.

**Suggested Practical List:**

1. Modeling using xADL
2. Analysis – Case study
3. Visualization using xADL
4. Integrate software components using a middleware
5. Use middleware to implement connectors
6. Wrapper to connect two applications with different architectures
7. Creating web service
8. Architecture for any specific domain

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/ Oral | Tutorial | Total |
| BEITC7053 | E-Commerce and E-Business | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC7053 | E-Commerce and E-Business | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

- To understand technical aspect of E-commerce and E-Business
- To describe the process of E-commerce and E-business
- To understand Infrastructure design issues of E-commerce

**Course Outcomes:**

Graduates will be able to design and conduct experiments, as well as analyze and interpret the technological, user, network requirements for developing the various modules of e commerce/business site, will be able to apply the knowledge gained and modern engineering tools in their application domain.

**Pre requisites:**

Internet Technologies, Database concepts, Internet Security, Middleware technologies, web services

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | **E – commerce :- Introduction to E commerce** | Definition of e com , different types of e com , Examples of e com E commerce trade cycle , Advantages and disadvantages of ecom , Traditional commerce Vs E commerce | **2** |
| 2 | **Overview of Hardware and software technologies for E com** | Client side programming ( Dream weaver , Front page ) , Server side programming (PHP) , Database connectivity , session tracking , middleware technologies from e com perspective and security aspects wrt to e commerce, integration of web services | **8** |
| 3 | **Payment System for e commerce** | Traditional payment model , Characteristics of payment system, SET Protocol for credit card payment, E-cash, E-check, smart cards | **8** |
| 4 | **E – Marketing Strategies** | Value chain , Working of e – market , Transactions at e – market , Strategies for marketing for selling on the web – Advertising supported , advertising subscription mixed model , fee for transaction model Sales and Promotions Strategies for Purchasing and support activities | **8** |
| 5 | **E business :- Introduction to e business** | Definition of e business , Characteristics , elements of e business , e business roles , Impact of e business , challenges of e business , difference between e business , e commerce | **4** |
| 6 | **Developing e business models** | E- business structure , Evolution of e –business and its stages , E – business models , Characteristics of Internet based software and e business solutions | **3** |
| 7 | **E-business strategies** | Strategic planning process, SCM , CRM , ERP , procurement | **7** |
| 8 | **Design and development of** | a) Building an e commerce website. :- SDLC , system design , Issues involved in designing a | **8** |

| | | | |
|---|---|---|---|
| | **an business website** | website , Prerequisites required for designing in – house website, steps involved in web site development , e-business and web site development solutions , security issues involved and analysing website traffic --- Case study<br>b) Analysis and design – (Workflow management, process modelling , data modelling ) , UI design , use case design , information architecture , security concerns | |

**Text Books:**

1. E-Commerce Fundamentals and application (Henry Chan) Wiley publication
2. Electronics Commerce (Gary Schneider) Thomson Course technology
3. E – Business , Parag Kulkarni , Sunita Jahirabadkar, Pradip Chande , Oxford Higher Education , Oxford University Press
4. E –business and E – commerce Management , Dave Chaffey , Pearson , 3rd edition
5. E commerce by Laudon

**References:**

1. E- Commerce Strategies, Technology and applications (David Whitley) Tata McGrawHill
2. Introduction to E-commerce Elias Awad

**Term work:**

Term work should include at least 8 experiments.

Journal must include at least 2 assignments.

Term work: - 25 marks (total) = 15 marks (experiments) + 5 marks ( Assignments ) + 5 marks (attendance – theory + Practical).

**Oral exam will be based on the above syllabus.**

**Suggested Practical List (If Any):**

**Exp 1: All experiments should be part of final e-commerce / e business portal development**

1. Home page design
2. Form validation (Ajax enabled)
3. Catalog design and Search techniques (Web mining , and Ajax enabled)
4. Access control mechanism (session management)
5. Payment systems
6. Security features
7. Creating Web Site to integrate web Services
8. Server side using Web Services

**Exp 2:** Case study of M commerce, bit coins, Google app engine, and other current e com / e business technologies

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme Hrs./Week | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/ Oral | Tutorial | Total |
| BEITC7054 | Multimedia Systems | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC7054 | Multimedia Systems | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

- To understand technical aspect of Multimedia Systems
- To understand and evaluate the process of development of Multimedia Systems
- To understand the framework and standards available for different Multimedia applications

**Course Outcomes:**

Students will be able to understand the relevance and underlying infrastructure of multimedia systems. The purpose of this course is to make the students capable to apply their multimedia knowledge to understand the current requirements of multimedia products. The standards and frameworks introduced will help the students develop the multimedia systems as per industry standards

**Pre requisites:**

Interactive I/O devices, Networking, basic concepts communication devices, Standards & frameworks

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | Introduction to Multimedia | What is multimedia, Hypermedia, Multimedia tools, Multimedia Authoring & its Tools, VERML, File Formats. | **2** |
| 2 | Color in Images & Video | Colour Models for Images & Videos, Video Signals, Digital Video, MIDI, Quantization, Transmission of Audio | **4** |
| 3 | Compression Algorithms | Lossless Compression , Introduction, Basics, RLC ,VLC, lossless Image Compression, Lossy Compression, introduction, Distortion, Rate Distortion Theory, Quantization | **4** |
| 4 | Image Compression Standards | JPEG standards, JPEG 2000 standards, JPEG –LS standards, Bi-Level Image Compression Standards | **4** |
| 5 | Video Compression Techniques | Introduction, Motion Compensation ,Motion vectors, H.261& H.263,MPEG-1&MEPEG-2MPEG_4,MPEG-7,MPEG21 | **5** |
| 6 | Audio Compression | ADPCM, Vocoders, Psychoacoustics, MPEG audio. | **3** |
| 7 | Multimedia Network Applications | Quality of Multimedia Data transmission, Multimedia over IP, Multimedia over ATM, Media on Demand, Multimedia over Wireless Network | **6** |
| 8 | Multimedia Data bases | Design and Architecture of Multimedia Data base, Types, Organization, Medias Abstraction, Query Language. | **7** |
| 9 | Frame Work for Multimedia Standards | Introduction, Standard Activates, Standard to built a news Global Information Infrastructure, Standardization process on Multimedia Communication, ITU-I Mediacom 2004 Framework, ISO/MPEG -21 Framework, IETF Multimedia Internet Standards. | **6** |

| | | | |
|---|---|---|---|
| 10 | Application layer: | Introduction, ITU applications, MPEG Application , Digital Broadcasting Applications, Universal multimedia access. | **7** |

**Text Books:**

1) Fundamentals of Multimedia by Ze-Nian Li& Mark.S.Drew

2) Introduction to Multimedia Communication, Application, Middleware, Networking by K.R.Roa, Zoran S,Bojkovic & Dragorad A. Milovanovic.

**References:**

Multimedia systems by Thakker

**Term work:**

Term work should include at least 8 experiments.

Journal must include at least 2 assignments.

Term work :- 25 marks (total) = 15 marks ( experiments) + 5 marks ( Assignments ) + 5 marks (attendance – theory + Practical).

**Oral exam will be based on the above syllabus.**

**Suggested Practical List (if any):**

1) Creating sample movies/ animations in flash.

2) Designing a multimedia application / multimedia authoring system.

3) Design a web application using dream viewer &fireworks

4) Construction of website using pictures, video, audio

5) Design a game application in flash

6) Record speech & perform compression & decompression

7) Case study on all file formats related to multimedia system

8) Case study on different authoring tools

9) Different levels of control in slide show presentation

**Theory Examination:**

1. Question paper will comprise of 6 questions, each carrying 20 marks.
2. Total 4 questions need to be solved.
3. Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
4. Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | Credits Assigned | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC7055 | Usability Engineering | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC7055 | Usability Engineering | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

Is to provide concrete advice and methods that can be systematically employed to ensure a high degree of usability in the final user interface.

**Course Outcomes:**

Students will be able to create useful usable and used interface.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | 1 | **Introduction**<br>Cost Savings, Usability Now, Usability Slogans, Discount Usability Engineering, Recipe For Action, Usability and Other Considerations, Definition of Usability, Example: Measuring the Usability of Icons, Usability Trade-Offs, Categories of Users and Individual User Differences | **06** |
| 2 | 2 | **Generations of User Interfaces**<br>Batch Systems, Line-Oriented Interfaces, Full-Screen Interfaces, Graphical User Interfaces, Next-Generation Interfaces, Long-Term Trends in Usability | **02** |
| 3 | 3 | **The Usability Engineering Lifecycle**<br>Know the User, Competitive Analysis, Goal Setting, Parallel Design, Participatory Design, Coordinating the Total Interface, Guidelines and Heuristic Evaluation, Prototyping, Interface Evaluation, Iterative Design, Follow-Up Studies of Installed Systems, Meta-Methods, Prioritizing, Usability Activities. | **08** |
| 4 | 4 | **Usability Heuristics**<br>Simple and Natural Dialogue, Speak the Users' Language, Minimize User Memory Load, Consistency, Feedback, Clearly Marked Exits, Shortcuts, Good Error Messages, Prevent Errors, Help and Documentation, Heuristic Evaluation. | **08** |
| 5 | 5 | **Usability Testing**<br>Test Goals and Test Plans, Getting Test Users, Choosing Experimenters, Ethical Aspects of Tests with Human, Subjects, Test Tasks, Stages of a Test, Performance Measurement, Thinking Aloud, Usability Laboratories, | **08** |
| 6 | 6 | **Usability Assessment Methods beyond Testing**<br>Observation, Questionnaires and Interviews, Focus Groups, Logging, Actual Use, User Feedback, Choosing Usability Methods. | **04** |
| 7 | 7 | **Interface Standards**<br>National, International and Vendor Standards, Producing Usable In-House Standards.<br>**International User Interfaces**<br>International Graphical Interfaces, International Usability Engineering, Guidelines for | **08** |

| | | | |
|---|---|---|---|
| | | Internationalization, Resource Separation, Multilocale Interfaces. | |
| 8 | 8 | **Future Developments**<br>Theoretical Solutions, Technological Solutions, CAUSE Tools: Computer-Aided Usability Engineering, Technology Transfer | **04** |

**Text Books:**

- Usability Engineering by Jacob Nielson, Morgan Kaufmann, Academic Press.

* **eBook available**

**References:**

Developing User Interfaces - Ensuring Usability through Product & Process by Deborah Hix, Rex Hartson, Wiley

**Suggested Practical List (If Any): Refer appendix A of the text book for Practical Exercise.**

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC7056 | Ubiquitous Computing | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC7056 | Ubiquitous Computing | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

- To introduce the ideas of ubiquitous computing techniques based on human experience.
- To generate an ability to design, analyze and perform experiments on real life problems using various smart devices, smart interaction and smart environment.
- To integrate computation into the environment, rather than having computers as distinct objects.
- To enable people to move around and interact with computers more naturally than they currently do.

**Course Outcomes:**

On successful completion of this course the student has: Knowledge and understanding regarding:

- The objectives and the historical development of the field of ubiquitous computing
- Fundamentals of sensor technology and sensor networks
- Apply middleware techniques to implement ubiquitous computing systems
- Design of new (often embedded) interactive artifacts
- Context aware and adaptive systems
- Compare the usability of alternative design of interactions for specific ubiquitous computing systems

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | Introduction to Ubiquitous Computing | Definition, Advantage, Application and Scope. Properties of Ubiquitous Computing, Ubiquitous System Environment Interaction. Architectural Design for UbiCom Systems: Smart DEI Model. | **4** |
| 2 | Smart Devices and Services | Introduction to Smart Devices: Users, Mobiles, Cards and Device Networks. Service Architecture Models. Service Provision Life-Cycle. Virtual Machines and Operating Systems Mobile Computers and Communicator Devices. | **8** |
| 3 | Sensing and Controlling | Tagging the Physical World. Sensors and Sensor Networks. Micro Actuation and Sensing: Micro-Electro-Mechanical Systems (MEMS). Embedded Systems and Real-Time Systems. Control Systems for Physical World Tasks. Robots | **8** |
| 4 | Context-Aware Systems | Introduction to Context-Aware Computing, Context-Aware Systems, Context-Aware Applications, Designing and Implementing Context-Aware Applications, Issues for building Context-Aware Applications. | **8** |
| 5 | Human–Computer Interaction | User Interfaces and Interaction for Four Widely Used Devices. Hidden UI Via Basic Smart Devices. Hidden UI Via Wearable and Implanted Devices. Human-Centered Design (HCD). User Models: Acquisition and Representation. iHCI Desi | **10** |
| 6 | Ubiquitous Communication | Data Networks. Audio Networks. Wireless Data Networks. Universal and Transparent Audio, Video and Alphanumeric Data. Ubiquitous Networks. Network Design Issues. Human Intelligence Versus Machine Intelligence. Challenges in Ubiquitous System, Social Issues: Promise Versus Peril. | **10** |

**Text Books:**

[1] Stefan Poslad. Ubiquitous Computing: Smart Devices, Environments and Interactions, Wiley Publication.

[2] John Krumm. Ubiquitous Computing Fundamentals. CRC Press.

**References:**

[1] Yin-Leng Theng and Henry B. L. Duh. Ubiquitous Computing: Design, Implementation, and Usability. IGI Global.

[2] Adam Greenfield. Everyware the Drawing age of Ubiquitous Computing, Published in Association with AIGA.

[3] Mobile and Ubiquitous Computing", Georgia Tech, 2003.

**Term work:**

Term work will be based on Practical and Assignments covering the topics of the syllabus.

**Suggested Practical List (If Any):**

1. Applications for location-based messages
2. Global Positioning system
3. Context-Aware system
4. Human Computer Interaction
5. Ubiquitous Communication
6. Case study of Class Room 2020
7. Case study of Super Market
8. Case study of Hospital Management

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITP706 | Project I | --- | * | --- | --- | 03 | --- | 03 |

***Work load of the teacher in semester VII is equivalent to 6 hrs/week.**

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITP706 | Project I | --- | --- | --- | --- | 25 | --- | 25 | 50 |

**Objective:** To help the learner to develop some of the following:

1. Relate theory with real time applications.

2. Experiencing the issues involved with creation and design of simple products and processes.

**Outcomes:** The learner should be able to prepare a synopsis of the work selected.

**Guidelines for Project**

- Students should do literature survey/visit industry/analyze current trends and identify the problem for Project and finalize in consultation with Guide/Supervisor. Students should use multiple literatures and understand the problem. Students should attempt solution to the problem by experimental/simulation methods. The solution to be validated with proper justification and compile the report in standard format.

**Guidelines for Assessment of Project I**

- Project I should be assessed based on following points
  - Quality of problem selected
  - Clarity of Problem definition and Feasibility of problem solution
  - Relevance to the specialization
  - Clarity of objective and scope
- Project I should be assessed through a presentation by a panel of Internal and External examiners appointed by the University of Mumbai.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC801 | Storage Network Management and Retrieval | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC801 | Storage Network Management and Retrieval | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

a. Study and evaluate the need for Storage networking, current storage technologies: SAN, NAS, IP storage etc., which will bridge the gap between the emerging trends in industry and academics.

b. Understanding and building Storage networks and its backup and recovery techniques.

c. Study the information retrieval system as per different application in storage networks.

**Course Outcomes:**

1) Students will be able to evaluate storage architectures, including storage subsystems, SAN, NAS, and IP-SAN, also define backup, recovery.
2) Examine emerging technologies including IP-SAN.
**3)** Define information retrieval in storage network and identify different storage virtualization technologies.

**Prerequisite: Computer Networks, Database Management Systems and Operating Systems**

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| I | NEED FOR STORAGE NETWORK | INTRODUCTION:- Limitations of traditional server centric architecture,. Storage centric architecture and its advantages.<br><br>BASICS OF STORAGE NETWORK:- Intelligent Storage Systems (ISS), Data protection ( RAID implementation methods).RAID arrays ,Components, RAID technologies, RAID levels, RAID impact on disk, performance & RAID comparison. | **10** |
| II | STORAGE NETWORK ARCHITECTURE | SCSI, SAN: FC SAN FC Protocol Stack, IP Storage, Infiniband, Virtual Interfaces | **08** |
| III | ADVANCED STORAGE TECHNOLOGY | NETWORK ATTACHED STORAGE (NAS):- Local File systems, Network File systems and file servers, Shared Disk File systems: Case study, Comparison: NAS, FC SAN and iSCSI SAN.<br><br>STORAGE VIRTUALIZATION:- Virtualization in I/O path, Limitations and requirements, Definition of Storage Virtualization, Storage virtualization on Block and file level, Storage virtualization on various levels of Storage network, Symmetric and Asymmetric Virtualization. | **14** |
| IV | STORGAE NETWORK BACKUP AND RECOVERY | BC Terminology, BC Planning Lifecycle, General Conditions for Backup, Recovery Considerations, Network Backup Services Performance Bottlenecks of Network Backup, Backup Clients, Back up file systems, Backup Databases, Next Generation Backup. | **06** |

| | | | |
|---|---|---|---|
| V | INFORMATION RETRIEVAL IN STORAGE NETWORK | Overview, Abstraction , Information System, Measures, from Data to Wisdom, Document and Query Form, Query structures, The matching process, Text analysis: Indexing, Matrix representation, Term extraction, Term association, , Stemming , Multilingual retrieval systems | **10** |

**Text Books:**


1. ULF Troppen, Rainer Erkens and Wolfgang Muller , " Storage Networks Explained: Basic and Applications of Fibre Channel SAN, NAS and ISCSI and Infifniband " , Wiley
2. EMC Educational Services, "Information Storage and Management", wiley India
3. R. R. Korfhage, "Information Storage and Retrieval", Wiley


**References:**


1. Richard Barker and Paul Massiglia, " Storage Area Network Essentials: A Complete Guide to Understanding and Implementing SANs" , Wiley.
2. Robert Spalding, " Storage Networks: The Complete Reference", Tata McGraw Hill
3. W. Curtis Preston, "Using SANs and NAS", O'Reilly


**Term work:** based on Laboratory Practical's/ Case studies and assignment

1. Term work shall consist of 10 practical implementation, case studies and study of simulators or tools available.
2. Study and implementation of simulation tool Navishpere and Unisphere related to storage network management.
3. Case study on Building and implementing SAN.
4. Study and implementation of any information retrieval tool.

**Theory Examination:**

• Question paper will comprise of 6 questions, each carrying 20 marks.
• Total 4 questions need to be solved.
• Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
• Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme Hrs./Week | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC802 | Big Data Analytics | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC802 | Big Data Analytics | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

1. To provide an overview of an exciting growing field of big data analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSql Map-Reduce.
3. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
4. To enable students to have skills that will help them to solve complex real-world problems in for decision support.

**Course Outcomes: At the end of this course a student will be able to:**

1. Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.
2. Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics.
3. Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
4. Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Book | Hours |
|---|---|---|---|---|
| 1 | Introduction to Big Data | Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Case Study of Big Data Solutions. | **From Ref. Books** | **03** |
| 2 | Introduction to Hadoop | What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Physical Architecture; Hadoop limitations. | Hadoop in Practise<br>Chapter 1 | **02** |
| 3 | NoSQL | 1. What is NoSQL? NoSQL business drivers; NoSQL case studies;<br>2. NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns;<br>3. Using NoSQL to manage big data: What is a big data NoSQL solution? Understanding the types of big data problems; Analyzing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer; Four ways that NoSQL systems handle big data problems | **No-SQL book** | **04** |
| 4 | MapReduce and the New Software Stack | **Distributed File Systems :** Physical Organization of Compute Nodes, Large-Scale File-System Organization.<br>**MapReduce:** The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures.<br>**Algorithms Using MapReduce**:<br>Matrix-Vector Multiplication by MapReduce , Relational-Algebra Operations, Computing Selections by MapReduce,<br>Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step. | **Text Book 1** | **06** |

| | | | | |
|---|---|---|---|---|
| 5 | Finding Similar Items | Applications of Near-Neighbor Search, Jaccard Similarity of Sets, Similarity of Documents, Collaborative Filtering as a Similar-Sets Problem .<br>**Distance Measures:** Definition of a Distance Measure , Euclidean Distances, Jaccard Distance, Cosine Distance, Edit Distance, Hamming Distance. | **Text Book 1** | **03** |
| 6 | Mining Data Streams | **The Stream Data Model**: A Data-Stream-Management System, Examples of Stream Sources, Stream Querie, Issues in Stream Processing.<br>**Sampling Data in a Stream** : Obtaining a Representative Sample , The General Sampling Problem, Varying the Sample Size.<br>**Filtering Streams**:<br>The Bloom Filter, Analysis.<br>**Counting Distinct Elements in a Stream**<br>The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements .<br>**Counting Ones in a Window**:<br>The Cost of Exact Counts, The Datar-Gionis-Indyk-Motwani Algorithm, Query Answering in the DGIM Algorithm, Decaying Windows. | **Text Book 1** | **06** |
| 7 | Link Analysis | PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: PageRank Iteration Using MapReduce, Use of Combiners to Consolidate the Result Vector.<br>Topic sensitive Page Rank, link Spam, Hubs and Authorities. | **Text Book 1** | **05** |
| 8 | Frequent Itemsets | **Handling Larger Datasets in Main Memory**<br>Algorithm of Park, Chen, and Yu, The Multistage Algorithm, The Multihash Algorithm.<br>**The SON Algorithm and MapReduce**<br>**Counting Frequent Items in a Stream**<br>Sampling Methods for Streams, Frequent Itemsets in Decaying Windows | **Text Book 1** | **05** |
| 9 | Clustering | CURE Algorithm, Stream-Computing , A Stream-Clustering Algorithm, Initializing & Merging Buckets, | **Text** | **05** |

| | | | | |
|---|---|---|---|---|
| | | Answering Queries | **Book 1** | |
| 10 | Recommendation Systems | A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering. | **Text Book 1** | **04** |
| 11 | Mining Social-Network Graphs | Social Networks as Graphs, Clustering of Social-Network Graphs, Direct Discovery of Communities, SimRank, Counting triangles using Map-Reduce | **Text Book 1** | **05** |

**Text Books:**


1. Anand Rajaraman and Jeff Ullman "**Mining of Massive Datasets**", Cambridge University Press,
2. Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press.
3. Dan McCreary and Ann Kelly "**Making Sense of NoSQL" – A guide for managers and the rest of us**, Manning Press.


**References:**


1. Bill Franks **, "Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics**", Wiley
2. Chuck Lam, "**Hadoop in Action**", Dreamtech Press
3. Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, "**Big Data for Dummies",** Wiley India
4. Michael Minelli, Michele Chambers, Ambiga Dhiraj, "**Big Data Big Analytics: Emerging Business Intelligence And Analytic Trends For Today's Businesses",** Wiley India
5. Phil Simon**, "Too Big To Ignore: The Business Case For Big Data",** Wiley India
6. Paul Zikopoulos, Chris Eaton**, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data',** McGraw Hill Education.
7. Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich**, "Professional Hadoop Solutions",** Wiley India.

**Oral Exam:**

An oral exam will be held based on the above syllabus.

**Term work:**

Assign a case study for group of 2/3 students and each group to perform the following experiments on their case-study; Each group should perform the exercises on a large dataset created by them.

**Term work: (15 marks for programming exercises + 10 marks for mini-project)**

**Suggested Practical List:** Students will perform at least 8 programming exercises and implement one mini-project. The students can work in groups of 2/3.

1. Study of Hadoop ecosystem
2. 2 programming exercises on Hadoop
3. 2 programming exercises in No SQL
4. Implementing simple algorithms in Map- Reduce (3) - Matrix multiplication, Aggregates, joins, sorting, searching etc.
5. Implementing any one Frequent Itemset algorithm using Map-Reduce
6. Implementing any one Clustering algorithm using Map-Reduce
7. Implementing any one data streaming algorithm using Map-Reduce
8. Mini Project: One real life large data application to be implemented (Use standard Datasets available on the web)
   a) Twitter data analysis
   b) Fraud Detection
   c) Text Mining etc.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC803 | Computer Simulation and Modeling | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC803 | Computer Simulation and Modeling | 20 | 20 | 20 | 80 | 25 | 25 | --- | 150 |

**Course Objectives:**

This course presents an introduction to discrete event simulation systems. Emphasis of the course will be on modeling and the use of simulation languages/software to solve real world problems in the manufacturing as well as services sectors. The course discusses the modeling techniques of entities, queues, resources and entity transfers in discrete event environment. The course will teach the students the necessary skills to formulate and build valid models, implement the model, perform simulation analysis of the system and analyze results properly.

The "theory" of simulation involves probability and statistics, thus a good background in probability and statistics is a required prerequisite

**Course Outcomes:**

- Understand the meaning of simulation and its importance in business, science, engineering, industry and services
- Identify the common applications of discrete-event system simulation.
- Practice formulation and modeling skills.

- Understand simulation languages
- Ability to analyze events and inter-arrival time, arrival process, queuing strategies, resources and disposal of entities
- An ability to perform a simulation using spreadsheets as well as simulation language/package
- Ability to generate pseudorandom numbers using the Linear Congruential Method
- Ability to perform statistical tests to measure the quality of a pseudorandom number generator
- Ability to define random variate generators for finite random variables
- Ability to analyze and fit the collected data to different distributions

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | UNIT - I<br>Introduction to simulation | Introduction to Simulation.<br>Simulation Examples.<br>General Principles | **15** |
| 2 | UNIT - II<br>Mathematical & Statistical Models in Simulation | Statistical Models in simulation.<br>Queuing Models | **8** |
| 3 | UNIT - III<br>Random Numbers | Random Number Generation.<br>Testing random numbers (Refer to Third edition)<br>Random Variate Generation: Inverse transform technique, Direct Transformation for the Normal Distribution, Convolution Method, Acceptance-Rejection Technique (only Poisson Distribution). | **9** |
| 4 | UNIT – IV<br>Analysis of simulation data | Input Modeling<br>Verification, Calibration and Validation of Simulation Models<br>Estimation of absolute performance. | **12** |
| 5 | UNIT V | Case study | |

| | | | |
|---|---|---|---|
| | Application | • Processor and Memory simulation<br>• Manufacturing & Material handling | **4** |

**Text Books:**

Discrete Event System Simulation; Third Edition, Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, Prentice-Hall

Discrete Event System Simulation; Fifth Edition, Jerry Banks, John Carson, Barry Nelson, and David M. Nicol, Prentice-Hall

**References:**

1. System Modeling & Analysis; Averill M Law, 4th Edition TMH.
2. Principles of Modeling and Simulation; Banks C M , Sokolowski J A; Wiley
3. System Simulation ; Geoffrey Gordon ; EEE
4. System Simulation with Digital Computer; Narsing Deo, PHI

**Term work:**

Laboratory work: 10 marks

Mini Simulation Project presentation: 10 marks

Attendance / Quiz: 5 marks

**Suggested Practical List (If Any):**

Perform simulation exercises given in the text book (third edition) using spreadsheets and/or simulation language/package

- Queue- single server, multi-server, classic case- dump truck
- Inventory – Lead time=0, lead time fixed, lead time probabilistic
- Reliability problem
- Tutorials on statistical models
- Random number generate and test
- Goodness of fit test
- Output analysis – Point estimate and Confidence Interval

Simulation: Real World Examples – can be in the field of business, transportation, medical, computing, manufacturing and material handling- Presentation to be taken.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC8041 | Enterprise Resource Planning | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC8041 | Enterprise Resource Planning | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives**: This course presents an introduction to ERP and related technologies. The course discusses ERP Manufacturing Perspective and ERP modules. The course will teach the learners the ERP implementation lifecycle, emphasis on ERP benefits and introduces the ERP tools.

**Course Outcomes:** The learner will be familiar with ERP and related technologies like Business Processing Reengineering (BPR), Supply Chain Management (SCM),Customer Relationship Management(CRM), MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System etc. The learner should gain the knowledge on ERP tools and ERP benefits.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1. | Introduction to ERP | Enterprise – An Overview<br>Integrated Management Information, Business Modeling, Integrated Data Model | 04 |
| 2. | ERP and Related Technologies | Business Processing Reengineering(BPR), Data Warehousing, Data Mining,<br>On-line Analytical Processing(OLAP), Supply Chain Management (SCM),<br>Customer Relationship Management(CRM), MIS - Management Information<br>System, DSS - Decision Support System, EIS - Executive Information System | 06 |
| 3. | ERP Manufacturing Perspective | MRP - Material Requirement Planning, BOM - Bill Of Material, MRP -<br>Manufacturing Resource Planning, DRP - Distributed Requirement Planning,<br>PDM - Product Data Management | 06 |
| 4. | ERP Modules | Finance, Plant Maintenance, Quality Management, Materials Management | 06 |
| 5. | Benefits of ERP | Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality, Costs, Improved Information Accuracy and Design-making Capability | 06 |
| 6. | ERP Implementation Lifecycle | Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode) | 06 |
| 7. | ERP case Studies | E-Commerce to E-business<br>E-Business structural transformation, Flexible Business Design, Customer Experience, Create the new techo enterprise, New generation e-business leaders, memo to CEO, Empower your customer, Integrate Sales and Service, Integrated Enterprise applications | 06 |
| 8. | E-Business | Enterprise resource planning the E-business Backbone Enterprise architecture, planning, ERP usage in Real | 08 |

| | | | |
|---|---|---|---|
| | Architecture | world, ERP Implementation, Future of ERP applications, memo to CEO ,E-Procurement, E-Governance, Developing the E-Business Design | |
| 9. | Introduction to ERP tools | JD Edwards-Enterprise One<br>Microsoft Dynamics-CRM Module | 04 |

**Text Books:**

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Enterprise Resource Planning – Diversified by Alexis Leon, TMH.
3. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal , Galgotia.

**Reference Books:**

1. Guide to Planning ERP Application, Annetta Clewwto and Dane Franklin, McGRaw-Hill, 1997
2. The SAP R/3 Handbook, Jose Antonio, McGraw – Hill
3. E-Business Network Resource planning using SAP R/3 Baan and Peoplesoft : A Practical Roadmap For Success By Dr. Ravi Kalakota

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs/Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC8042 | Wireless Sensor Networks | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC8042 | Wireless Sensor Networks | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

1. To understand the concepts of sensor networks and study the architecture of WSN.

2. To understand applications of WSN.

3. To discuss the challenges in designing MAC and routing protocols for wireless sensor networks.

4. To study different operating systems and look at performance issues.

5. To understand WSN Standards and future trends in WSN.

5. To study Challenges of Security in Wireless Sensor Networks and Protocols and Mechanisms for Security.

**Course Outcomes:**

1. Students shall be able to understand and study the functionalities, applications and architecture of WSN.

2. Students shall be able to describe the challenges in designing various protocols for wireless sensor networks.

3. Students shall be able to understand the current technology trends for the implementation and deployment of wireless sensor networks.

4. Students shall gain an understanding of WSN Standards and future trends in WSN.

5. Students shall be able to understand security aspects like Privacy issues, attacks and countermeasures.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1. | Overview and Introduction of Wireless Sensor Network | Background of Sensor Network Technology; Types of Application; Challenges for WSNs: Characteristics requirements, Required mechanism; Basic Sensor Network Architectural Elements; Sensor Network scenarios: Types of sources and sinks, single-hop versus multi hop networks, Multiple sinks and sources, three types of mobility; Some examples of sensor nodes: Mica Mote family, EYES nodes, BT nodes. | **6** |
| 2. | Applications of Wireless Sensor Network | Category 1(C1WSNs), Category 2(C2WSNs), Range of Applications, Examples of Category 1 WSN (C1WSNs) Applications, and Examples of Category 2 WSN(C2WSNs) Applications. | **4** |
| 3. | MAC Protocols | Fundamentals of (wireless) MAC protocols, Requirements and design considerations for MAC Protocols in WSN, Low duty cycle protocols and wakeup concepts, STEM,S-MAC, Mediation device protocol, Wakeup radio concepts, Contention- based protocols, CSMA protocols, PAMAS, Schedule-based protocols, LEACH, SMACS, Traffic-adaptive medium access protocol(TRAMA),IEEE 802.15.4 MAC protocol, Slotted CSMA-CA protocol | **9** |

| | | | |
|---|---|---|---|
| 4. | Network and Transport layer Protocol. | Network layer :<br>Data Dissemination and Gathering, Routing Challenges and Design Issues, Routing Strategies: Flooding and it's variants, Power-Efficient Gathering in Sensor Information Systems, Geographical routing,<br>Transport layer :<br>Transport protocol Design issues, Examples of Existing Transport Control Protocols: CODA, ESRT, RMST, PSFQ, GARUDA, ATP; Performance of Transport Control Protocols :Congestion, packet loss recovery. | **7** |
| 5. | Operating Systems , Performance and Traffic Management Issues | Operating System Design Issues, Examples of Operating Systems: TinyOS, Mate, MagnetOS, MANTIS,OSPM,EYES OS, SenOS, EMERALDS, PicOS , WSN Design Issues,<br>Performance Modeling of WSNs | **7** |
| 6. | WSN standards and Future trends in wireless sensor networks | Wireless sensor network standards-IEEE 802.15.4 Low rate WPAN standard, The ZIGBEE alliance etc. Future trends in wireless sensor networks: Wireless Multimedia Sensor Networks, Sensor Network Applications in Challenging Environments. | **6** |
| 7 | Security | Fundamentals of Network Security ,Challenges of Security in Wireless Sensor Networks, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, IEEE 802.15.4 and ZigBee Security | **9** |

**Text Books:**


1. HOLGER KARL,ANDREAS WILLIG., "*Protocols, and Architectures: For Wireless Sensor Networks*", Wiley Student Edition
2. Kazem Sohraby, Daniel Minoli, Taieb Znati., "*Wireless Sensor Networks: Technology, Protocols, and Applications*", Wiley Student Edition.
3. Waltenegus Dargie and Christian Poellabauer., "*Fundamentals of Wireless Sensor Networks-Theory & Practice*", John Wiley publication, 2010.
4. J. Zheng and A. Jamalipour, "*Wireless Sensor Networks : A Networking Perspective* " John Wiley publication,2009

**References:**

1. Edgar H. Callaway Jr., *"Wireless Sensor Networks - Architectures and Protocols",*AUERBACH Publications, CRC Press, 2004.

2. Feng Zhao, Leonidas Guibas ,"*Wireless Sensor Networks: An Information Processing Approach"* , Morgan Kaufmann Series in Networking 2004.

**Term work:** Term work shall consist of at least 06 experiments from the suggested list & 04 assignments based on the syllabus.

Distribution of marks for term work shall be as follows.

1. Attendance (Theory & Practical) :05 marks
2. Laboratory Work (Experiment & Journal):15 marks
3. Assignment : 05 marks.

The final certification and acceptance of Term work ensures the satisfactory performance of laboratory work and minimum passing in the term work.

**Suggested Practical List :**

1. Installation of OMNET ++.

2. Installation & configuration of TinyOS.

3. Implementation of any two routing algorithms using JAVA

4. Implementation of any two programs on Tiny OS.

5. Study of any of the WSN operating systems.

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Term Work /Practical | Tutorial | Total |
| BEITC8043 | Geographical Information Systems | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | | | | | |
| BEITL8043 | Geographical Information Systems | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objective:**

- To provide an understanding of the basic concepts and uses of GIS technology
- To develop an ability to analyze, interpret geospatial data
- To provide an understanding of the basic principles of Remote Sensing and its use in GIS
- To provide a research platform for students in the area of GIS adapting to ever changing Technologies

**Course Outcomes:**

After completing this course, students will be able to:

- Apply the knowledge of science for real world applications in GIS
- Design and conduct experiments as well as analyze, interpret the geospatial data using GIS tools
- Function with multidisciplinary Teams.
- Use the techniques, skills and modern engineering tools necessary for engineering practice.
- Adapt to Open source standards

**DETAILED SYLLABUS:**

| Module No. | Unit No. | Details of Topic | Hrs. |
|---|---|---|---|
| **1.0** | | **Fundamentals of GIS** | 06 |
| | 1.1 | Introduction, Definition of GIS, Evolution of GIS , components of GIS, | |
| | 1.2 | Geospatial Data, Geographic Coordinate System, Map Projections, Commonly Used Map Projections, UTM grid system, Map Scale | |
| | 1.3 | Cartographic Symbolization, Types of Maps, Typography, Map Design, Map Production | |
| **2.0** | | **Data Management, Models and Quality Issues** | 06 |
| | 2.1 | Vector Model : Topology, Non topological Vector models, Attribute Data in GIS, Attribute Data Entry, Vector Data Query, Manipulation of Fields and Attribute Data | |
| | 2.2 | Raster Data Model : Elements of Raster Data Model, Types of Raster Data, Raster Data Structure, Raster Data Query, Data Compression, Data Conversion, Integration of Raster and Vector data | |
| | 2.3 | Data input and editing, Data quality Issues: Accuracy, Consistency, Precision and Resolution, Completeness; sources of error in GIS | |
| **3.0** | | **GIS Data Exploration Analysis and Visualization** | 2+2+4+4=12 |
| | 3.1 | Data exploration: Descriptive statistics, Graphs, Dynamic Graphics | |
| | 3.2 | Vector Data Analysis: Buffering, Overlay, Distance Measurement, Pattern Analysis, Map Manipulation | |
| | 3.3 | Raster Data Analysis: Local Operations, Neighborhood Operations, Zonal Operations, Data Extraction, Data Generalization, Comparison of Vector and Raster Based Data | |
| | 3.4 | Spatial Interpolation: Elements of Spatial Interpolation, Global methods, Local Methods, Kriging, Comparison of Spatial Interpolation Methods | |
| **4.0** | | **Terrain mapping, Geocoding and Segmentation** | 04 |
| | 4.1 | Terrain Mapping and Analysis: Data for Terrain Mapping and Analysis: DIM, TIN, Terrain Mapping, Slope and Aspect, Surface Curvature, Raster versus TIN | |
| | 4.2 | Geocoding and Dynamic Segmentation: Geocoding, Applications of Geocoding, Dynamic Segmentation, Applications of Dynamic Segmentation | |

| | | | |
|---|---|---|---|
| **5.0** | | **Remote Sensing Fundamentals** | 12 |
| | 5.1 | Remote Sensing: Basic Principles, Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Surface Materials, , Energy Interactions with Earth's Atmosphere, Spectral Reflectance Curves | |
| | 5.2 | Microwave Remote Sensing, The Radar Principle, Factors Affecting Microwave Measurements, Radar Wavebands, SLAR Systems, SAR, Interpreting SAR Images, Geometrical Characteristics, Remote Sensing, Platform and Sensors, Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites. Data Formats, Standard Products | |
| | 5.3 | Visual Image Interpretation: Information Extraction By human and Computer, Remote sensing Data Products, Image Interpretation, Elements of Image Interpretation | |
| **6.0** | | **Project Management** | 04 |
| | 6.1 | Planning of Project , Implementation of Project, Management of Project, Case study | |
| **7.0** | | **Modern trends and Applications of GIS** | 04 |
| | 7.1 | Multimedia GIS, Internet GIS, Mobile GIS **,**Applications of GIS in Urban and municipal area | |

**Recommended Books**


1. Kang-tsung Chang, "Introduction to Geographical Information Systems", Tata McGraw Hill, Third Edition, 2003
2. M. Anji Reddi, "Remote Sensing and Geographical Information Systems", B. S. Publications, Second Edition, 2001
3. Basudeb Bhatta ,Remote Sensing and GIS ,Oxford University Press,2nd Edition
4. Ian Heywood, Sarah Cornelius & etal., "An Introduction to Geographical Information Systems", 2nd Edition, Pearson Education
5. A.M. Chandra and S.K. Ghosh, Remote Sensing and Geographical Information Systems , Narosa Publishing House Pvt ltd.
6. Peter A Burrough and McDonell, "Principles of Geographical Information Systems", Oxford University Press, 1998.
7. M. N. DeMers, "Fundamentals of Geographic Information Systems", 3rd edition, Wiley.
8. George B Korte, "The GIS Book", Onword press, Thomson Learning, 5th Edition, 2003
9. Tor Bernhardsen, "Geographic Information Systems – An Introduction", 3rd edition, Wiley Publications

**Internal Assessment (IA):**

Two tests must be conducted which should cover at least 80% of the syllabus. The average marks of both the tests will be considered as final IA marks.

**Term Work:**

Term Work shall consist of at least 10 programs based on the above syllabus using any suitable software.

Distribution of marks for term work shall be as follows:
1. Attendance (Theory and Practical): 05 Marks
2. Laboratory work (Performing Experiments and Journal): 20 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

**Theory Examination:**
- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Term Work /Practical | Tutorial | Total |
| BEITC8044 | Robotics | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Course Code | Course Name | Examination Scheme | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | | | | | |
| BEITL8044 | Robotics | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:** The Lerner is introduced to the fundamentals and kinematics of Robots. The topics like Differential motions & velocities, Trajectory Planning, Mobile Robot Motion Planning etc. are discussed.

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

a. Understand kinematics and dynamics of stationary and mobile robots
b. Understand trajectory planning for rigid robot and mobile robots
c. Implement trajectory generation and path planning algorithms
d. Work in interdisciplinary projects

**Detailed Syllabus:**

| | | | |
|---|---|---|---|
| **1. Fundamentals** | Robot Classification, Robot Components, Degrees of freedom, Joints, Coordinates, Coordinate frames, workspace, applications | 03 Hrs | Chapter 1 – Text Book 1 |
| **2. Kinematics of Robots** | Homogeneous transformation matrices, Inverse transformation matrices, Forward and inverse kinematic equations – position and orientation, Denavit-Hatenberg representation of forward kinematics, Inverse kinematic solutions, Case studies | 07 Hrs | Chapter 2 – Text Book 1 |
| **3. Differential motions and velocities** | Differential relationship, Jacobian, Differential motion of a frame and robot, Inverse Jacobian | 06 Hrs | Chapter 3 – Text Book 1 |
| **4. Dynamic Analysis of** | Lagrangian mechanics, Moments of | 07 Hrs | Chapter 4 – |

| | | | |
|---|---|---|---|
| **Forces** | Inertia, Dynamic equations of robots, Transformation of forces and moment between coordinate frames | | Text Book 1 |
| **5. Trajectory Planning** | Trajectory planning, Joint-space trajectory planning, Cartesian-space trajectories | 07 Hrs | Chapter 5 – Text Book 1 |
| **6. Mobile Robot Motion Planning** | Concept of motion planning, Bug Algorithms – Bug1, Bug2, Tangent Bug | 04 Hrs | Chapter 2 – Text Book 2 |
| **7. Potential Functions and Visibility Graphs** | Attractive/Repulsive potential, Gradient descent, wave-front planner, navigation potential functions, Visibility map, Generalized Voronoi diagrams and graphs, Silhouette methods | 08 Hrs | Chapter 4 & 5 – Text Book 2 |
| **8. Coverage Planning** | Cell Decomposition, Localization and Mapping | 06 Hrs | Chapter 6, 9 – Text Book 2 |

**Text Books**


1. Saeed Benjamin Niku, "Introduction to Robotics – Analysis, Control, Applications", Wiley India Pvt. Ltd., Second Edition, 2011
2. Howie Choset, Kevin M. Lynch, Seth Hutchinson, George Kantor, Wolfram Burgard, Lydia E. Kavraki and Sebastian Thrun, "Principles of Robot Motion – Theory, Algorithms and Implementations", Prentice-Hall of India, 2005.


**Reference Books**


1. Mark W. Spong & M. Vidyasagar, "Robot Dynamics & Control", Wiley India Pvt. Ltd., Second Edition, 2004
2. John J. Craig, "Introduction to Robotics – Mechanics & Control", Third Edition, Pearson Education, India, 2009
3. Aaron Martinez & Enrique Fernandez, "Learning ROS for Robotics Programming", Shroff Publishers, First Edition, 2013.

**Term Work:**

Term Work shall consist of at least 10 programs based on the above syllabus using any suitable software.

Distribution of marks for term work shall be as follows:
1. Attendance (Theory and Practical): 05 Marks
2. Laboratory work (Performing Experiments and Journal): 20 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

**List of Experiments:**

Note: At least one experiment shall be performed from every group. Total number of experiments should be 10.

1. Forward kinematics of n-DOF robot arm – Simulation – (maximum 2 experiments)
2. Inverse Kinematics of n-DOF robot arm – Simulation (maximum 2 experiments)
3. Dynamic modeling of n-DOF robot arm & Simulation (maximum 2 experiments)
4. Trajectory planning of n-DOF robot arm (maximum 2 experiments)
5. Simulation of Bug1, bug2 and tangent bug algorithms (maximum 3 experiments)
6. Simulation of Potential field, voronoi graph, and visibility graph methods (maximum 3 experiments)

**Theory Examination:**
- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs/Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC8045 | Soft Computing | 04 | 02 | --- | 04 | 01 | --- | 05 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC8045 | Soft Computing | 20 | 20 | 20 | 80 | 25 | --- | 25 | 150 |

**Course Objectives:**

**AIM:** To introduce the techniques and methodologies of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

- To introduce the ideas of soft computational techniques based on human experience.
- To generate an ability to design, analyze and perform experiments on real life problems using various Neural Learning Algorithms.
- To conceptualize fuzzy logic and its implementation for various real world applications.
- To apply the process of approximate reasoning using Neuro-Fuzzy Modeling.
- To provide the mathematical background to carry out optimization using genetic algorithms.

**Course Outcomes:**

Student should be able to mimic human like thought process on deterministic machines and apply it to different real world problems faced in the professional front.

**DETAILED SYLLABUS:**

| Sr.No. | Module | Detailed Content | Hours |
|---|---|---|---|
| 1 | Introduction to Soft Computing | **Neural Networks:** Definition, Advantages, Applications, Scope. **Fuzzy logic:** Definition, Applications. **Hybrid System:** Definition, Types of Hybrid Systems, Applications. **Genetic Algorithms:** Definition, Applications. | **2** |
| 2 | Neural Networks | **Fundamental Concepts and Models of Artificial Neural Systems:** Biological Neurons and Their Artificial Models, Models of Artificial Neural Networks, Neural Processing, Learning and Adaptation, Neural Network Learning Rules and Comparison. **Linearly and Non-Linearly Separable Pattern Classification. Perceptron Convergence Theorem. Multi-layer Feedforward Network:** Delta Learning Rule for Multiperceptron Layer**,** Generalized Delta Learning Rule, Feedforward Recall and Error Back-propagation Training, LearningFactors,CharacterRecognitionApplication. **Associative Memory:** Hopfield Network, Bidirectional Associative Memory. **Radial Basis Function Networks.** | **20** |
| 3 | Fuzzy Set Theory | Brief Review of Conventional Set Theory, Introduction to Fuzzy Sets, Properties of Fuzzy Sets, Operations on Fuzzy Sets, Membership Functions.Fuzzy Extension Principle, Fuzzy Relations, Projection and Cylindrical Extension of Fuzzy Relations, Fuzzy Max-Min and Max-Product Composition. Fuzzy Knowledge Based Systems with Applications, Defuzzification Methods, Fuzzy Composition Rules, Architecture of Mamdani Type Fuzzy Control Systems. | **16** |
| 4 | Hybrid Systems | **ANFIS**: Adaptive Neuro-Fuzzy Inference Systems: Introduction, ANFIS Architecture, and Hybrid Learning Algorithm. | **4** |
| 5 | Genetic Algorithms | What are Genetic Algorithms? Why Genetic Algorithms? Biological Background: The Cell, Chromosomes, Genetics, Reproduction, Neural Selection, Traditional Optimization and Search Techniques, Genetic Algorithm and Search space: Simple GA, General GA, Operators in GA, Encoding, Selection, Crossover, Mutation, Stopping Condition for GA flow, Constraints in GA, Problem solving using GA, Classification of GA. | **6** |

**Text Books:**

1. Jacek M. Zurada, "Introduction to Artificial Neural Systems," Jaico Publishing House.

2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications," 3rd ed. Wiley India.

3. S. N. Sivanandam and S. N. Deepa, "Principles of Soft Computing," 2nd ed. Wiley India.

4. Jang J.S.R, Sun C. T. and Mizutani E., "Neuro-Fuzzy and Soft Computing – A Computational Approach to Learning and Machine Intelligence," PHI.

**References:**

1. Laurene Fausett, "Fundamentals of Neural Networks – Architectures, Algorithms, And Applications," Pearson Education.
2. Hagan T. Martin, H. B. Demuth, and Mark Beale, "Neural Network Design," Thomson Learning.
3. Satish Kumar, "Neural Networks – A classroom Approach," 2nd ed. Tata McGraw Hill.
4. Kishan Mehrotra, Chilukuri. K. Mohan, and Sanjay Ranka, "Elements of Artificial Neural Networks," 2nd ed. Penram Int. Publishing India.
5. H. J. Zimmermann, "Fuzzy Set Theory and its Applications," Allied Publishers Ltd.
6. Driakov D. Hellendoorn H. and Reinfrank M., "An Introduction to Fuzzy Control," Narosa Publishing House.

**Term work:**

Term work will be based on Practical and Assignments covering the topics of the syllabus.

**Suggested Practical List (If Any):**

1. Fuzzy membership function
2. Fuzzy Extension principle
3. Fuzzy controller
4. Perceptron Learning rule
5. Delta Learning Rule
6. Associative Memory
7. Genetic Algorithm
8. Competitive Learning

**Theory Examination:**

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITC8046 | Software Testing & Quality Assurance | 04 | 02 | --- | 04 | 01 | -- | 05 |

| Subject Code | Subject Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITC8046 | Software Testing & Quality Assurance | 20 | 20 | 20 | 80 | 25 | | 25 | 150 |

**Course Objectives:** The students will learn

I. Basic software debugging methods.
II. White box and Black box testing methods
III. Writing the testing plans
IV. Different testing tools

**Course Outcomes:**

**After completion of course the students will able to:**

**1:** Identify the reasons for bugs and analyze the principles in software testing to prevent and remove bugs.
**2:** Implement various test processes for quality improvement
**3:** Apply the software testing techniques in commercial environments
**4:** Provides practical knowledge of a variety of ways to test software and an understanding of some of the trade-offs between testing techniques.
**5:** Familiar with the open source testing tools.

**DETAILED SYLLABUS:**

| Sr. No. | Module | Detailed Content | Hours |
|---|---|---|---|
| | Unit-I Testing Methodology | Introduction, Goals of Software Testing, Software Testing Definitions, Model for Software Testing, Effective Software Testing vs Exhaustive Software Testing, Software Failure Case Studies, Software Testing Terminology, Software Testing Life Cycle (STLC), Software Testing methodology, Verification and Validation, Verification requirements, Verification of high level design, Verification of low level design, validation. | **10** |
| | Unit II Testing Techniques | Dynamic Testing : Black Box testing: boundary value analysis, equivalence class testing, state table based testing, cause-effect graphing based testing, error guessing.<br><br>White box Testing Techniques: need, logic coverage criteria, basis path testing, graph matrices, loop testing, data flow testing, mutation testing. Static Testing.<br><br>Validation Activities: Unit validation, Integration, Function, System, Acceptance Testing.<br><br>Regression Testing: Progressive vs. Regressive, regression testing produces quality software, regression testability, objectives of regression testing, regression testing types, define problem, regression testing techniques. | **12** |
| | Unit III Managing the Test Process | Test Management: test organization, structure and of testing group, test planning, detailed test design and test specification.<br><br>Software Metrics: need, definition and classification of software matrices.<br><br>Testing Metrics for Monitoring and Controlling the Testing Process: attributes and corresponding matrics, estimation model for testing effort, architectural design, information flow matrix used for testing, function point and test point | **10** |

| | | | |
|---|---|---|---|
| | | analysis.<br><br>Efficient Test Suite Management: minimizing the test suite and its benefits, test suite minimization problem, test suite prioritization its type , techniques and measuring effectiveness. | |
| | Unit IV Test Automation | Automation and Testing Tools: need, categorization, selection and cost in testing tool, guidelines for testing tools. Study of testing tools: WinRunner, QTP, LoadRunner, TestDirector and IBM Rational Functional Tester, Selenium etc. | **8** |
| | Unit V Testing for Specialized Environment | Testing Object Oriented Software: OOT basics, Object-oriented testing.<br><br>Testing Web based Systems: Web based system, web technology evaluation, traditional software and web based software, challenges in testing for web based software, testing web based testing, Testing a data warehouse | **5** |
| | Unit VI Quality Management | Software Quality Management, McCall's quality factors and Criteria, ISO 9126 quality characteristics, ISO 9000:2000,software quality management | **3** |

**Text Books:**


1. Software Testing Principles and Practices Naresh Chauhan Oxford Higher Education
2. Effective Methods for Software Testing , third edition by Willam E. Perry, Wiley Publication
3. Software Testing and quality assurance theory and practice by Kshirasagar Naik, Priyadarshi Tripathy , Wiley Publication
4. Software Testing Concepts and Tools by Nageswara Rao Pusuluri , dreamtech press


**References:**


1. Foundation of Software Testing 2 e , by Aditya P. Mathur , Pearson publication

2. Software Testing Tools by Dr. K.V.K.K. Prasad , dreamtech press

3. Software Testing Principles, techniques and tools by M.G. Limaye , Mc Graw Hill publication

**Term work:**

Term work will be based on Practical and Assignments covering the topics of the syllabus.

**Suggested Practical List:**

1. Write programs in C Language to demonstrate the working of the following
a. constructs: i) do...while ii) while….do iii) if…else iv)switch v) for

2. A program written in C language for Matrix Multiplication fails. Introspect the causes for its failure and write down the possible reasons for its failure.

3. Take any system (e.g. ATM system) and study its system specifications and report the various bugs.

4. Write the test cases for any known application (e.g. Banking application)

5. Create a test plan document for any application (e.g. Library Management System)

6. Design Test case using boundary value analysis by taking quadratic equation problem.

7. Design a test cases using equivalent class partitioning taking triangle problem

8. Study of any testing tool (e.g. Win runner)

9. Study of any web testing tool (e.g. Selenium)

10. Study of any test management tool (e.g. Test Director)

12. Study of any open source-testing tool (e.g. Test Link)

**Theory Examination:**

• Question paper will comprise of 6 questions, each carrying 20 marks.
• Total 4 questions need to be solved.
• Q.1 will be compulsory, based on entire syllabus where in sub questions of 2 to 3 marks will be asked.
• Remaining question will be randomly selected from all the modules.

Weight age of marks should be proportional to number of hours assigned to each module.

| Course Code | Course Name | Teaching Scheme (Hrs./Week) | | | Credits Assigned | | | |
|---|---|---|---|---|---|---|---|---|
| | | Theory | Practical | Tutorial | Theory | Practical/Oral | Tutorial | Total |
| BEITP805 | Project II | --- | ** | --- | --- | 06 | --- | 06 |

****Work load of the teacher in semester VIII is equivalent to 12 hrs/week.**

| Course Code | Course Name | Examination Scheme | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Theory Marks | | | | Term Work | Practical | Oral | Total |
| | | Internal assessment | | | End Sem. Exam | | | | |
| | | Test 1 | Test 2 | Avg. of 2 Tests | | | | | |
| BEITP706 | Project I | --- | --- | --- | --- | 50 | --- | 50 | 100 |

**Course Objectives:**

1. Implimentaion of the topic selected in Project-I.

2. Initiating the learners to technical writing and documentation for reuse.

3. Developing proficiency in carrying out critical analysis, review and study of existing literature on technological experimentation and finding out of scholastic investigation

**Outcomes:** The learner should be able to:

1. Demonstrate the product that is implemented.

2. Produce the proper documentation of the work.

3. Able to work in team and communicate with peers.

4. Develop skills required by the industry.

**Guidelines for Project**

- Students should do literature survey/visit industry/analyze current trends and identify the problem for Project and finalize in consultation with Guide/Supervisor. Students should use multiple literatures and understand the problem. Students should attempt solution to the problem by experimental/simulation methods. The solution to be validated with proper justification and compile the report in standard format.

**Guidelines for Assessment of Project II**

- Project II should be assessed based on following points
  - Quality of problem selected
  - Clarity of Problem definition and Feasibility of problem solution
  - Relevance to the specialization / Industrial trends
  - Clarity of objective and scope
  - Quality of work attempted
  - Validation of results
  - Quality of Written and Oral Presentation
- Report should be prepared as per the guidelines issued by the University of Mumbai.
- Project II should be assessed through a presentation jointly by Internal and External Examiners approved by the University of Mumbai
- Students should be motivated to publish a paper based on the work in Conferences/students competitions