# UNIVERSITY OF CALICUT

# SCHEME AND SYLLABI

**FOR**

# THIRD AND FOURTH SEMESTERS

**OF**

# BACHELOR OF TECHNOLOGY

**IN**

# INFORMATION TECHNOLOGY

**FROM 2004 ADMISSION ONWARDS**

## CALICUT UNIVERSITY (P.O), THENHIPALAM

# IT: INFORMATION TECHNOLOGY

### THIRD SEMESTER

| Code | Subject | Hours/Week | | | Internal Marks | University Examination | |
|---|---|---|---|---|---|---|---|
| | | L | T | P/D | | Hrs | Marks |
| EN04 301B | ENGINEERING MATHEMATICS-III | 3 | 1 | - | 50 | 3 | 100 |
| IT04 302 | DATA STRUCTURES & ALGORITHMS | 3 | 1 | - | 50 | 3 | 100 |
| IT04 303 | DISCRETE COMPUTATIONAL STRUCTURES | 3 | 1 | - | 50 | 3 | 100 |
| IT04 304 | BASIC ELECTRONICS ENGINEERING | 3 | 1 | - | 50 | 3 | 100 |
| IT04 305 | SWITCHING THEORY & LOGIC DESIGN | 3 | 1 | - | 50 | 3 | 100 |
| IT04 306 | TECHNICAL ARGUMENTATION | 3 | 1 | - | 50 | 3 | 100 |
| IT04 307(P) | **PROGRAMMING LAB** | - | - | 3 | 50 | 3 | 100 |
| IT04 308(P) | **DIGITAL ELECTRONICS LAB** | - | - | 3 | 50 | 3 | 100 |
| **TOTAL** | | **18** | **6** | **6** | **400** | **-** | **800** |

### FOURTH SEMESTER

| Code | Subject | Hours/Week | | | Internal Marks | University Examination | |
|---|---|---|---|---|---|---|---|
| | | L | T | P/D | | Hrs | Marks |
| EN04 401B | ENGINEERING MATHEMATICS-IV | 3 | 1 | - | 50 | 3 | 100 |
| EN04 402 | ENVIRONMENTAL STUDIES | 3 | 1 | - | 50 | 3 | 100 |
| IT04 403 | SYSTEM PROGRAMMING | 3 | 1 | - | 50 | 3 | 100 |
| IT04 404 | MICROPROCESSOR BASED DESIGN | 3 | 1 | - | 50 | 3 | 100 |
| IT04 405 | PROGRAMMING PARADIGMS | 3 | 1 | - | 50 | 3 | 100 |
| IT04 406 | COMMUNICATION SYSTEMS | 3 | 1 | - | 50 | 3 | 100 |
| IT04 407(P) | **DATA STRUCTURE LAB** | - | - | 3 | 50 | 3 | 100 |
| IT04 408(P) | **PROGRAMMING ENVIRONMENTS LAB** | - | - | 3 | 50 | 3 | 100 |
| **TOTAL** | | **18** | **6** | **6** | **400** | **-** | **800** |

# SYLLABI OF THIRD SEMESTER

## EN04 301B ENGINEERING MATHEMATICS-III

(Common with CS04 301B)

| 3 hours lecture and 1 hour tutorial per week |
|---|

**Module I: Linear Algebra (13 hours)**

Vector spaces – Linear dependence and Independence and their computation – Bases and dimension-Subspaces – Gram-Schmidt orthogonalization process – Linear transformations – Elementary properties of linear transformations – Matrix of a linear transformation (Proofs of Theorems are not required).

**Module II: Fourier integrals and Fourier transforms (13 hours)**

Fourier integral (Proof not required) – Fourier sine and cosine integral representations – Fourier sine and cosine transforms – Properties of Fourier transforms – Singularity functions and their Fourier transforms.

**Module III: Complex Analytic Functions (13 hours)**

Function of a complex variable – Derivative-Analytic function – Cauchy-Riemann equations – Laplaces equation – Conformal mapping – Exponential function – Trigonometric functions – Hyperbolic functions – Logarithm – Linear fractional transformations.

**Module IV: Complex Integrals (13 hours)**

Line integral in the complex plane – Cauchy's integral theorem (Proof of existence of indefinite integral to be omitted) – Cauchy's integral formula – Derivatives of an analytic functions (Proof to be omitted) – Taylor series – Laurent series – Singularities and zeros – Residue integration method – Evaluation of real integrals.

**Text book**

**Module 1** : K.B. Datta, Matrix and Linear algebra for engineers, Prentice hall of India

**Module 2** : Wylie C.R and Barret L.C, Advanced Engineering Mathematics 6th Edition, McGraw Hill

**Module 3** : Erwin Kreyszig – Advanced Engineering Mathematics 8th Edition, John Wiley & Sons

**Module 4** : Erwin Kreyszig – Advanced Engineering Mathematics 8th Edition, John Wiley & Sons

**Reference books**

1. R.S.L Srivastava, Engineering Mathematics (Volume II) Tata McGraw Hill
2. S.Narayan, T K Manicavachagom Pillai & Dr. Ramanaiah- Advanced Mathematics for Engineering Students,S Viswanathan Publishers
3. R K Jain & R K Iyengar, Advanced Engineering Mathematics, Narosa Publishing house
4. Lipschutz S, Linear Algebra, Schaum's Outline Series, McGraw Hill

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 05 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module

Q II - 2 questions of 15marks each from module I with choice to answer any one

Q III - 2 questions of 15marks each from module II with choice to answer any one

Q IV - 2 questions of 15marks each from module III with choice to answer any one

Q V - 2 questions of 15marks each from module IV with choice to answer any one

**IT04 302 DATA STRUCTURES & ALGORITHMS**
(Common with CS04 302)

3 hours lecture and 1 hour tutorial per week

**Module I (12 hours)**
Review of data types - scalar types - primitive types - enumerated types - subranges structures types - character strings - arrays - records - sets - tiles - data abstraction - complexity of algorithms - time and space complexity of algorithms using "big oh" notation - recursion: recursive algorithms - analysis of recursive algorithms

**Module II (12 hours)**
Linear data structures - stacks - queues - lists - stack and queue implementation using array - linked list - linked list implementation using pointers

**Module III (12 hours)**
Non linear structures: graphs -trees - sets - graph and tree implementation using array linked list - set implementation using bit string, linked list

**Module IV (16 hours)**
Searching - sequential search - searching arrays and linked lists - binary search - searching arrays and binary search trees - hashing - introduction to simple hash functions - resolution of collisions - sorting: $n^2$ sorts - bubble sort - insertion sort - selection sort - NlogN sorts - quick sort - heap sort - merge sort - external sort - merge files

**Text book**
1. Aho A.V., Hopcroft J.E. & Ullman J.D., *Data Structures and Algorithms*, Addison Wesley

**Reference books**
1. Sahni S., *Data Structures, Algorithms, & Applications in C++*, McGraw Hill
2. Wirth N., *Algorithms +Data Structures = Programs*, Prentice Hall
3. Cormen T.H., Leiserson C.E., & Rivest R.L., *Introduction to Algorithms*, MIT Press, 1990
4. Adam Drozdek, Data Structures and Algorithms in C++, Thomson Brooks/cole – Vikas Pub. House pvt. Ltd.
5. Deshpande P.S, Kakde O.G, *C and Data structures*, Dream – tech India Pvt. Ltd.

**Sessional work assessment**

| | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 05 |
| Total marks | = 50 |

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

**IT04 303 DISCRETE COMPUTATIONAL STRUCTURES**
(Common with CS04 303)

3 hours lecture and 1 hour tutorial per week

**Module 1 (13 hours)**

Logic - Logical connectives and Truth tables – Logical equivalence and laws of logic – Logical implication and rules of inference- Quantifiers – Proofs of theorems using rules of universal specification and universal generalization.

**Module II (13 hours)**

Relational Structures - Cartesian products – Relations – Relation matrices – Properties of relations – Composition of relations- Equivalence relations and partitions- Functions – One-to-one, onto functions – Composition of functions and inverse functions- Partial orders- Hasse diagrams.

**Module III (13 hours)**

Group Theory - Definition and elementary properties- Cyclic groups- Homomorphisms and Isomorphisms - Subgroups- Cosets and Lagrange's theorem-Elements of coding theory- Hamming metric-Generator matrices-Group codes- Hamming matrices.

**Module IV (13 hours)**

Rings and Fields - Definitions and examples of rings, integral domains and fields- Elementary properties and substructures - Homomorphisms and isomorphisms – The ring $Z_n$ - Polynomial rings – Irreducible polynomials and finite fields.

**Text book**

1. Ralph P Grimaldi, *Discrete and Computational Mathematics*: An applied introduction (Fourth Edition), Pearson Education, 2004.

**Reference books**


1. Tremblay, J P & Manohar,R, *Discrete and Mathematical Structures with Applications to Computer Science*, McGraw Hill Book Company.
2. Kolman B & Busby R C, *Discrete and Mathematical Structures for Computer Science*, Prentice Hall of India.
3. Donald F Stanat & David F Mc Allister, *Discrete and Mathematical Structures in Computer Science*, Prentice Hall.
4. Truss J K, *Discrete Mathematics for Computer Scientists*, Pearson Education, 2001.
5. Herstein I N, *Topics in Algebra*, Wiley Eastern.
6. Garding, L & Tambour T, *Algebra for Computer Science*, Narosa Publishing House, New Delhi.


**Sessional work assessment**

| | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Attendance | =05 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

**IT04 304 BASIC ELECTRONICS ENGINEERING**
(Common with CS04 304)

| 3 hours lecture and 1 hour tutorial per week |
|---|

**Module I (15 hours)**

Electronic components - Concepts of voltage and current sources - Energy bands in solids, metals, insulators and semiconductors - Intrinsic and extrinsic semiconductors - PN junction theory - V-I characteristics - Diode resistance - Rectifiers - Performance analysis of rectifiers - Filters, zener, varactor and power diodes - LEDs. Transistors - Working and amplifying action - Characteristics - Comparison between CE, CB and CC configurations - CE Amplifier, construction of transistors - Use of data sheet - Thermal runaway - UJT, introduction to FETs

**Module II (12 hours)**

Transistor biasing - Selection of operating point - Bias stabilization - Different biasing circuits - PNP biasing - Small signal amplifiers - Single stage amplifier - Graphical method - Equivalent circuit method - Amplifier analysis - FET amplifier - Multistage amplifiers - Gain analysis - RC coupled amplifier - Frequency response - Two stage RC coupled amplifier - Distortion in amplifiers - Classification of amplifiers

**Module III (13 hours)**

Power amplifiers - Single-ended power amplifier - Harmonic distortion - Push-pull amplifier - Tuned voltage amplifier - Resonance - Single-tuned voltage amplifier - Feedback in amplifiers - Types of feedback - Voltage gain with feedback - Negative feedback - Oscillators - Classification - LC oscillators - RC oscillators - Crystal oscillators – A stable multivibrator

**Module IV (12 hours)**

Operational amplifiers - Inverting and non-inverting amplifiers - Adder - Voltage follower - Differential amplifier - Integrator and differentiator - Zero-crossing detector - Precision diode - Peak detector - Logarithmic amplifier - Square and triangle wave generator - Analog computation - Active filters

**Text books**

1. Bhargava N.N., Kulshreshtha D.C. & Gupta S.C., *Basic Electronics & Linear Circuits*, Tata McGraw Hill (Modules I, II & III)
2. Nagarath J., *Electronics Analog & Digital*, Prentice Hall India (Module IV)

**Reference books**

1. Millman J. & Halkias C.C., *Integrated Electronics: Analog & Digital Circuits & Systems*, Tata McGraw Hill
2. Schilling D.L. & Belove C., *Electronic Circuits: Discrete & Integrated*, McGraw Hill

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 05 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

**IT04 305 SWITCHING THEORY & LOGIC DESIGN**
(Common with CS04 305)

| 3 hours lecture and 1 hour tutorial per week |
|---|

**Module I (14 hours)**

Number Systems and codes - *Boolean algebra* - Postulates and theorems - Constants, variables and functions - Switching algebra - Electronic gates and mechanical contacts *Boolean functions and logical operations* - Normal and canonical forms - Self-dual functions - Logical operations - *Karnaugh map* - Prime cubes - Minimum sum of products and product of sums - Quine-McClusky algorithm

**Module II (13 hours)**

Combinational Logic - Analysis and design of combinational logic circuits - Universal property of the NAND and NOR gates – Adders - Parallel adders and look-ahead adders – Comparators - Decoders and encoders - Code conversion - Multiplexers and demultiplexers - Parity generators and checkers - ROMs, PLAs

**Module III (10 hours)**

Fault diagnosis and tolerance - Fault classes and models - Fault diagnosis and testing - Test generation - Fault table method - Path sensitization method - Boolean difference method - Fault-tolerance techniques. *Programmable logic arrays* - PLA minimization - Essential prime cube theorem - PLA folding - Design for testability

**Module IV (15 hours)**

Counters and shift registers - SR, JK, D and T flip-flops - Excitation tables - Triggering of flip-flops - Flip-flop applications - Latches - Ripple counters - Synchronous counters - Up-down counters - Design of sequential circuits - Counter decoding - Counter applications - Shift registers and their applications - *Clock mode sequential machine* - *S*tate tables and diagrams

**Text books**

1. Biswas N.N., *Logic Design Theory*, Prentice Hall of India (modules I, II & III)
2. Floyd T.L., *Digital Fundamentals*, Universal Book Stall (module IV)

**Reference books**

1. Kohavi Z., *Switching & Finite Automata Theory*, Tata McGraw Hill
2. Millman J. & Halkias C.C., *Integrated Electronics: Analog & Digital Circuits & Systems*, Tata McGraw Hill
3. M.Morris Mano, Charles R. Kime, *Logic and Computer Design Fundamentals*, Pearson Education

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 05 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## IT04 306 TECHNICAL ARGUMENTATION

| 3 hours lecture and 1 hour tutorial per week |
|---|

[**Objective**: This topic is concerned with the most fundamental aspects of academic study; abilities to reason with ideas and evidence, to formulate arguments effectively and to appreciate the interplay between ideas and evidence in debate. It introduces a student to the nature of good reasoning and how to test and construct good arguments without assuming any prior knowledge of logic or philosophy. The subject may work as a much-needed guide to thinking critically for oneself.]

**Module I (13 hours)**

Introduction to argument – choice of topic – defining audience – defining terms – planning argument – avoiding logical fallacies – case study of classic arguments of Mahatma Gandhi, Martin Luther King Jr.

**Module II (13 hours)**

Understanding forms of persuasion – Reading critically – Plagiarism – documenting sources – guide to research – avoiding selective research – case study involving issue of surfing the web.

**Module III (13 hours)**

Searching for magazine, journal, newspaper articles – using abstracting services, internet, books, other library resources – case study involving culture and curriculum

**Module IV (13 hours)**

Conducting interviews, surveys, compiling bibliography – organizing, writing and preparing researched paper – case study involving gun control and immigration – case study of select classic argument of Plato.

**Text books**

1. Robert K Miller, *The informed Argument*, Fifth Edition, Harcourt Brace College Publishers

**References:**

1. John Shand, *Arguing Well*, Routledge Publishers
2. Peter J Phelan, Peter J Reynolds, *Argument and Evidence*, Routledge Publishers
3. Tracy Bowell and Garry Kemp, *Critical Thinking*, Routledge Publishers
5. David Sanford, *If P then Q*, Routledge Publishers

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 05 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## IT04 307(P) PROGRAMMING LAB

3 hours practical per week

**[Objective:** This course is to give a strong programming concept so as to introduce the software engineering techniques to the students of computing streams. For adequacy this has to be complemented by exercises appearing in texts and references. Books have been carefully chosen to get examples from diverse computing applications for practice**]**

**Set 1 (3 lab sessions)**

HCF (Euclid's algorithm) and LCM of given numbers - Find mean - Median and mode of a given set of numbers - Conversion of numbers from binary to decimal, hexadecimal, octal and back - Evaluation of functions like $e^x$, sin*x*, cos*x* etc. for a given numerical precision using Taylor's series - Testing whether a given number is prime

**Set 2 (2 lab sessions)**

String manipulation programs: sub-string search, deletion - Lexicographic sorting of a given set of strings - Generation of all permutations of the letters of a given string using recursion

**Set 3 (2 lab sessions)**

Matrix operations: Programs to find the product of two matrices - Inverse and determinant (using recursion) of a given matrix - Solution to simultaneous linear equations using Jordan elimination

**Set 4 (2 lab sessions)**

Files: Text files - use of sequential files for storing records with provision for insertion - deletion, search, sort and update of a record. Implementation of random access files of records.

**Set 5 (2 lab sessions)**

Usage of program development & maintenance tools (for example "make") - Examples of accessing operating system environment from within program, conditional assembly- Exercises involving standard I/O devices, argc, argv functions - Exercises demonstrating a few system calls.
Note:- Make utility may used extensively to do the programming for this set of experiments.

**Reference books**


1. Schildt H., *C: The Complete Reference*, Tata McGraw Hill
2. Tan H.H. & D'Orazio T.B., *C Programming for Engineering & Computer Science*, McGraw Hill
3. Cormen T.H. et al, *Introduction to Algorithms*, Prentice Hall of India
4. Brian W Kernighan and Rob Pike, The Unix programming environment, Prentice Hall of India / Pearson Education Asia.


**Sessional work assessment**

| | |
|---|---|
| Lab practicals & record | = 25 |
| Regularity in the Class | = 05 |
| 2 tests | 2x10 = 20 |
| Total marks | = 50 |

**IT04 308 (P) DIGITAL ELECTRONICS LAB**

3 hours practical per week

[**Objective:** This course gives hand on experience on digital electronics components and systems; which are fundamental building blocks of the Computer systems. Experiments are structured to cover extensively the characteristic and features of indispensable digital electronic circuits and systems.]

1. Verification of truth tables of AND, OR, NOT, NAND, NOR and XOR gates, use for gating digital signals
2. TTL characteristics
3. Verification of the postulates of Boolean algebra and DeMorgan's theorem using logic gates
4. Half and full adders, half and full subtractors
5. Digital comparator, parity generator and checker, and code converter
6. Characteristics and operations of RS, gated RS, D, T, and JK master slave flipflops
7. Multiplexer and demultiplexer using gates
8. Shift register, ring counter, and twisted ring counter
9. Decade counter and variable modulo asynchronous counter
10. Astable multivibrator and schmitt trigger using gates, astable and monostable multivibrator and frequency divider using 555

**Reference books**


1. Nagarath J., *Electronics Analog & Digital*, Prentice Hall India
2. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill


**Sessional work assessment**

| | |
|---|---|
| Lab practicals & record | = 25 |
| Regularity in the Class | = 05 |
| 2 tests | 2x10 = 20 |
| Total marks | = 50 |

# SYLLABI OF FOURTH SEMESTER

## EN04 401B ENGINEERING MATHEMATICS-IV

(Common with CS04 401)

3 hours lecture and 1 hour tutorial per week

**MODULE I: Probability and Distributions (16hours)**

Introduction-Probability distributions-continuous random variables-Probability density functions-Mathematical expectation-The expected value of a random variable-Moments-Moment generating function-Special probability distributions-Binomial distribution-Geometric distribution-Hyper-geometric distribution-Poisson distribution-Special probability densities-Uniform density-Gamma and chi-square distributions-Normal distribution.

**MODULE II: Sampling Distributions & Estimation (10 hours)**

Population and samples-The sampling distribution of the mean-The sampling distribution of the variance Estimation-Introduction-Unbiased estimators-Efficiency-Consistency-Sufficiency-The method of maximum likehood-Interval estimation-The estimation of means-The estimation of variances.

**MODULE III: Testing Hypotheses (10 hours)**

Tests of hypotheses-Null hypotheses and tests of hypotheses-Hypotheses concerning one mean-Hypotheses concerning two means-Hypotheses concerning one variance- Hypotheses concerning two variances-Chi-square test for goodness of fit.

**MODULE IV: Jointly distributed random variables, Markov chains & Poisson processes (16 hours)**

Joint distribution functions-Independent random variables-Covariance and variance of sums of random variables-Joint probability distribution of functions of random variables-Stochastic processes-Conditional probability and conditional expectations.

Markov chains-Champman Kolmogorov equations-Exponential distribution-Properties of exponential distribution-Counting processes-Definition of Poisson process-Interval and waiting time distributions.

**Text book**

**Module 1** : John E Freund, Mathematical Statistics 5th Edition, Prentice Hall of India

**Module 2** : Johnson R.A, Miller & Freud's Probability & Statistics for Engineers 6th Edition Pearson Education Asia

John E Freund, Mathematical Statistics 5th Edition, Prentice Hall of India

**Module 3** : Johnson R.A, Miller & Freud's Probability & Statistics for Engineers 6th Edition Pearson Education Asia

**Module 4** : Ross S.M, Introduction to Probability Models 7th Edition, Academic Press

**Reference books**

1. Erwin Kreyszig – Advanced Engineering Mathematics 8th Edition, John Wiley & Sons
2. R.E.Walpole, R.H Myers, S.L Myers & Keying, Probability and Statistics For Engineers 7th Edition, Pearson Education Asia
3. Karlin S & Tailor.H, A first course in Stochastic process, Academic Press

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 05 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module

Q II - 2 questions of 15marks each from module I with choice to answer any one

Q III - 2 questions of 15marks each from module II with choice to answer any one

Q IV - 2 questions of 15marks each from module III with choice to answer any one

Q V - 2 questions of 15marks each from module IV with choice to answer any one

**EN04 402 ENVIRONMENTAL STUDIES**
(Common for all branches)

| 3 hours lecture and 1 hour tutorial per week |
|---|

**Objective:**
The importance of environmental science and environmental studies cannot be disputed. Continuing problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of bio diversity etc have made everyone aware of environment issues. The objective of this course is to create general awareness among the students regarding these environmental issues.

**Module I (12 Hours)**
**The Multidisciplinary nature of environmental studies**
Definition - scope and importance-need for public awareness.
**Natural Resources – Renewable and non-renewable resources:**
Natural resources and associated problems - forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people. - Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies - Land resources: Land as a resource, land degradation, man induced land slides, soil crosion and desertification - Role of an individual in conversation of natural resources - Equitable use of resources for sustainable lifestyle.

**Module II (14 Hours)**
Ecosystems - Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological pyramids - Introduction, types, characteristic features , structure and function of the following ecosystem:-Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries)
**Bio-diversity and its conservation**
Introduction – Definition: genetic, species and ecosystem diversity - Biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and local levels - India as a mega-diversity nation – Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wild life, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**Module III (11 Hours)**
**Environmental Pollution**
Definition - Causes, effects and control measures of:- Air pollution - Water pollution - Soil pollution - Marine pollution-Noise pollution -Thermal pollution - Nuclear hazards - Solid waste Management: Causes, effects and control measures of urban and industrial wastes -Role of an individual in prevention of pollution - Pollution case studies - Disaster management : floods, earthquake, cyclone and landslides - Environmental Protection Act - Air (Prevention and Control of Pollution ) Act - Water (Prevention and Control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public Awareness

**Module IV (10 Hours)**
**Social Issues and the Environment**
From unsustainable to sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns,case studies - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies - Wasteland reclamation - Consumerism and waste products
**Human Population and the environment**
Population growth, variation among nations - Population explosion – Family welfare Programme - Environment and human health – Pollution hazards, Sanitation and health - Human Rights for clean

environment - Value Education - HIV/AIDS-social concern - Women and Child Welfare - Role of information Technology in Environment and human health - Case studies

**Field Work (5 Hours)**

- Visit to a local area to document environmental assets – river/forest/grassland/hill/mountain
- Visit to local polluted site – Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems – pond, river, hill slopes, etc.

**Text book**


1. Clark, R.S. Marine Pollution. Clanderson Press Oxford
2. Mhaskar A.K, Matter Hazardous. Techno-science Publications
3. Miller, T.G. Jr. Environmental Science. Wadsworth Publishing Co.
1. Townsend, C., Harper, J. and Michael Begon, Essential of Ecology. Blackwell Science
2. Trivedi. R.K. and Goel . P.K. Introduction to air pollution. Techno – Science Publications


**Reference books**


1. Agarval. K.C.2001 Environmental biology. Nidi Publ. Ltd. Bikaner
2. Bharucha Erach, Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email: mapin@icenet.net
3. Brunner, R.C. 1989. Hazardous Waste Incineration. McGraw Hill Inc. 480p
4. Cunningham, W.P., Cooper, T.H., Gorhani, E & Hepworth, M.T. 2001Environmental encyclopedia Jaico publ. House Mumbai 1196p
5. De, A.K. Environmental Chemistry. Wiley Eastern Ltd.
6. Down to Earth, Centre for Science and Environment
7. Gleick, H.P. 1993. Water in crisis. Pacific Institute for Studies in Dev., Environment and security, Stockholm Env. Institute. Oxford Univ. Press. 473p
8. Hawkins, R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay
9. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
10. Jadhav, H. & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
11. Mckinney, M.L. & School, R.M. 1996. Environmental Science system & Solutions, Web enhanced edition, 639p.
12. Odum, E.P. 1971. Fundamentals of Ecology. W.B.Saunders Co. USA, 574p
13. Rao, M.N. & Datta, A.K 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd., 345p
14. Sharma, B.K. 2001. Environmental Chemistry. Goel Publ. House, Meerut.
15. Survey of the Environment, The Hindu (M)
16. Trivedi, R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II . Enviro Media
17. Wagner.K.D. 1998. Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p


**Sessional work assessment**

| | |
|---|---|
| 2 tests | = 20 |
| Field work and report (Internal assessment) | = 25 |
| Regularity in the Class | = 05 |
| Total marks | = 55 |

**University examination pattern**

Q I - 16 short type questions (to answer 12 out of 16) of 5 marks each, 4 from each module (12 x 5 = 60 Marks)
Q II - 2 questions of 10marks each from module I with choice to answer any one
Q III - 2 questions of 10marks each from module II with choice to answer any one
Q IV - 2 questions of 10marks each from module III with choice to answer any one
Q V - 2 questions of 10marks each from module IV with choice to answer any one

**IT04 403 SYSTEMS PROGRAMMING**
(Common with CS04 403)

| 3 hours lecture and 1 hour tutorial per week |
|---|

**[Objective:** The subject gives the essentials of system software design. System software consists of programs necessary to make the hardware function properly. The objective of the study of this subject is to equip the student with the right kind of tools for computer systems design and development.**]**

**Module I (15 hours)**
*Background* - system software machine architecture - the simplified instructional computer - traditional machines - RISC machines - *assemblers* - basic assembler functions - machine dependent and machine independent - assembler features - *assembler design* - assembler design options - implementation examples - AIX Assembler

**Module II (13 hours)**
*Loaders and linkers* - basic loader functions - machine dependent and machine independent loader features - loader design options and implementation examples - *macro processors* - basic macro processor functions - machine-independent macro processor features - macro processor design options and implementation examples

**Module III (15 hours)**
*Introduction to operating systems* - basic principles - batch processing - multiprogramming - timesharing systems and real-time systems - parallel and distributed systems - *computer system structure* - computer system operation - I/O structure - structure - storage hierarchy - hardware protection - general system architecture - *operating system structure* - system components - OS services - system calls - system structure - virtual machines

**Module IV (9 hours)**
*General overview of the UNIX operating system* - history of UNIX - system structure - user perspective - services - hardware assumptions - u*nix architecture* - system concepts - kernel data structures - system administration process (concepts only)

**Text books**
1. Beck L.L., *System Software - An introduction to Systems Programming*, Addison Wesley
2. Bach M.J., *The Design of the Unix Operating System*, Prentice Hall India

**Reference books**
1. Dhamdhere D.M., *Systems Programminmg and Operating Sytems*, Tata McGraw Hill
2. Godbole S., *Operating Systems,* Tata McGraw Hill

**Sessional work assessment**

| | |
|---|---|
| Assignments | 2x7.5 = 15 |
| 2 tests | 2x15 = 30 |
| Regularity | 5 |
| Total marks | = 50 |

**University examination pattern**
Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

**IT04 404 MICROPROCESSOR BASED DESIGN**
(Common with CS04 404)

| 3 hours lecture and 1 hour tutorial per week |
|---|

[**Objective:** The course depicts essential features of system design based on micro processors. Students get exposure to hardware, interfacing, programming and debugging. The course is also meant to enable students to design hardware systems for optimal performance. ]

**Module I (13 hours)**
Historical background of microprocessors - inside the PC - motherboard - graphic adapters and monitors - drive controllers - floppy and hard disk drives - streamers and other drives - parallel interfaces and printers - serial interfaces and modems - network adapters and LANs - CMOS RAM and real clock - keyboard, mouse and other rodents - the power supply - operating system - BIOS and memory organisation - *8086/8088 hardware specification*: clock generator - bus buffering and latching - bus timing - ready and wait states - minimum and maximum modes - advanced processors - features of 80386, 80486 and Pentium processors

**Module II (14 hours)**
Microprocessor architecture: real mode and protected mode memory addressing - memory paging - addressing modes - data addressing - program memory addressing - stack memory addressing - data movement instructions - arithmetic and logic instructions - program control instructions - programming the microprocessor: modular programming - using keyboard and display - data conversions - disk files - interrupt hooks

**Module III 13 hours)**
Memory interface - memory devices - address decoding, 8 bit (8088), 16 bit (8086), 32 bit (80486) and 64 bit (Pentium) memory interfaces - dynamic RAM. I/O interface - port address decoding - PPI, 8279 interface - 8254 timer interface - 16550 UART interface - ADC/DAC interfaces

**Module IV (14 hours)**
Interrupts - interrupt processing - hardware interrupts - expanding the interrupt - 8259A programmable interrupt controller - DMA: DMA operation - 8237 DMA controller - shared bus operation - disk memory systems - video displays - bus interface: ISA bus - EISA and VESA buses - PCI bus

**Text book**
1. Brey B.B., *The Intel Microprocessors 8086 to Pentium: Architecture, Programming and Interface*, Prentice Hall of India

**Reference books**
1. Messmer H.P., *The Indispensable PC Hardware Book*, Addison Wesley
2. Ray K. & Bhurchandi K.M., *Advanced Microprocessors & Peripherals*, Tata McGraw Hill
1. Hall D.V., *Microprocessors & Interfacing: Programming & Hardware*, Tata McGraw Hill
2. Miller K., *An Assembly Language Introduction to Computer Architecture using the Intel Pentium*, Oxford University Press
3. Bigelow S.J., *Troubleshooting, Maintaining & Repairing PCs*, Tata McGraw Hill

| **Sessional work assessment** | | |
|---|---|---|
| Assignments | 2x7.5 = 15 | |
| Tests | 2x15 = 30 | |
| Attendance/Regularity | | = 05 |
| Total marks | = 50 | |

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## IT04 405 PROGRAMMING PARADIGMS

3 hours lecture and 1 hour tutorial per week

**[Objective** of the course is to teach students about different models for programming and to introduce the various constructs and their implementation to support the model on a bare machine. The material is selected to be useful for the computing science stream. It is hoped that students will be familiar with principles of design of programming languages after going through this course. The text given is presenting the ideas using abstract notation; however, the first reference contain good illustration to the ideas and teachers are requested to include sufficient illustrations from the reference book while presenting ideas in class room. Paradigms lab will supplement the learning process.**]**

**Module I (15 hours)**

**Introduction:**

Role of programming languages - higher level languages - programming paradigms - language implementation on a machine - Language Syntax description - notations for expressions, abstract syntax trees, lexical syntax, context free grammars, variants of grammars - Language Semantic description - introduction to synthesized attributes, attributed grammar, natural semantics, denotational semantics.

**Imperative programming:**

Introduction - structured programming - constructs for structured control flow - syntactic concerns - handling special cases in loops - Discussion based on C.

Role of types - Basic types - compound types like arrays, records, union and variant records, sets - Pointers and dynamic allocation - Types and error checking - Discussion based on C.

Introduction to procedures - parameter passing methods - scope rules - nested scopes - implementation - discussion based on C.

**Module II (12 hours)**

**Object oriented programming:**

Introduction - Grouping of data and operations - Constructs for program structuring - Information hiding - Program design with modules - Modules and defined types - Illustration based on C++ on class declaration, dynamic allocation, templates, objects.

Definition of object - Object oriented thinking - Inheritance - Derived classes and information hiding - Illustration based on C++.

**Module III (12 hours)**

**Functional programming:**

Introduction - Elements of functional programming - Types: values and operations - Function declaration - approaches to expression evaluation - Lexical scope - Type checking.

Functional programming with lists - Introduction to Scheme - Structures of lists - List manipulation - Simplification of expression - Storage allocation for lists.

**Module IV (13 hours)**

**Logic programming:**

Introduction - Computing with relations - Introduction to PROLOG - Data structures - Programming techniques - Control in PROLOG - Cuts.

**Concurrent programming:**

Parallelism in hardware - Implicit synchronization - Interleaving - Liveness properties - Safe access to shared data - Synchronized access to shared variables.

**Text books**

1. Ravi Sethi; Programming Langes - Concepts and constructs; Pearson Education Asia

**Reference books**

1. Sayed H. Roosta; Foundations of Programming Languages Design and Implementation; Vikas Publishing House, New Delhi
2. Scott M.L.; Programming Language Pragmatics; Harcourt Asia(Morgan Kaufman)
3. Tennent R.D.; Principles of Programming Languages; Prentice Hall International
4. Appleby D. & Vandekopple J.J; Programming Languages: Paradigms & Practice; Tata McGrawHill
5. Clocksin W F, Mellish C S; Programming in PROLOG

**Internal work assessment**

30 - Test papers (minimum 2)
15 - Open book tests/Assignments/any other mode decided by the teacher
5 - Other measures like Regularity and Participation in Class.
Total marks = 50

**University examination pattern**

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

## IT04 406 COMMUNICATION SYSTEMS

| 3 hours lecture and 1 hour tutorial per week |
|---|

[**Objective** of this course is to give idea about the various transmission technology available for digital communication. This together with paper of digital data communication will give sound knowledge in designing custom communication network for an IT application. This course is touching more on the theory on how is each working. This is a pre-requisite for the computer network course also.]

**Module I (14 hours)**

*Noise in communication systems* - classification - SNR - CNR - noise figure - relationships between noise figures - *voice signal digitization* - PAM - PPM - PWM - PCM - delta modulation - PCM and DM voice signal comparison - TDM of PCM signals - CCITT - *digital radio* - block diagram - ASK - FSK - PSK - QAM - digital demodulation - QAM demodulation

**Module II (12 hours)**

*Line-of sight microwave links* - analog line of sight microwave links - digital line of sight microwave links - *communication satellites* - classification - communication satellite systems - orbits - planetary mechanics - launching - stabilization - subsystems and repeaters - *satellite earth stations* - antenna subsystems - transmitter - receiver

**Module III (13 hours)**

*Fibre optic communications* - nature of light - optical laws - optical fibres - optical sources - photo detection - *optical communication systems* - system parameters - analog optical fibre links - digital optical fibre systems

**Module IV (13 hours)**

*Satellite access* - FDM access - TDM access - *satellite links* - satellite link analysis and design - digital satellite link design - *system measurements* - Fourier series - the Z-transform - modulator/demodulator sensitivity measurements - digital microwave link measurements and performance evaluation - *high definition TV* - system specifications

**Text book**

Kolimbiris H., *Digital Communication Systems*, Pearson Education Asia

**Reference books**

1. Freeman R.L., *Tele Communication Transmission Hand Book*, Wiley
2. Panther P.F., *Communication System Design*, McGraw Hill
3. Ramaswami R. & Sivarajan K.N., *Optical Networks*, Harcourt Asia
4. Gagliardi R.M., *Satellite Communications*, CBS Publishers
5. Gowar, *Optical Communications*, PHI

**Sessional work assessment**

| | |
|---|---|
| Assignments | 2x7.5 = 15 |
| Tests | 2x15 = 30 |
| Regularity | = 5 |
| Total marks | = 50 |

**University examination pattern**

Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## IT04 407(P) DATA STRUCTURES LAB

| 3 hours practical per week |
|---|

1. *Stack and Queue*: Implementation using arrays and linked lists
2. *Searching Methods*: Binary search and hashing
3. *Sorting*: Recursive implementation of quick sort and merge sort
4. *Binary Search Tree*: Implementation with insertion, deletion and traversal
5. *Infix Expression Evaluation*: using expression tree
6. *Graph Search Algorithms*: DFS and BFS on a connected directed graph
7. *Minimal Spanning Tree*: Implementation of Kruskal's and Prim's algorithms
8. *Shortest Path Algorithms*: Dijkstra and Floyd Warshall algorithms
9. *Disjoint Set operations*: Union and Find using rank and path compression
10. *Applications of Heap*: Priority queue and heap sort

**Reference books**


1. Cormen T.H., Lieserson C.E. & Rivest R.L., *Introduction to Algorithms*, Prentice Hall of India
2. Sahni S., *Data structures, Algorithms, and Applications in C++*, McGraw Hill


**Sessional work assessment**

| | |
|---|---|
| Lab practicals & record | = 25 |
| 2 tests | 2x10= 20 |
| Regularity | = 5 |
| Total marks | = 50 |

## IT04 408(P) PROGRAMMING ENVIRONMENTS LAB

| 3 hours practical per week |
|---|

1. Familiarization with features of an editor (for example Vi, Emacs)
2. Shell programming, usage of tools like grep, awk etc…
3. Usage of program development & maintenance tools (for example "make")
4. Usage of debugging tools (for example "gdb")
5. Familiarization with scripting languages (for example Perl, Tcl/Tk)
6. Usage of Lexical processing tools (for example Lex)
7. Introduction to document formats(for example HTML, PDF). Scripting and generation of dynamic pages. Scripting languages and interaction.
8. Introduction to the tools providing GUI based human computer interaction(for example Qt). Automatic generation of code for interaction using visual programming(for example Qt Designer).
9. Introduction to tools for preparing documents (for example Word / Latex)

| **Sessional work assessment** | |
|---|---|
| Lab practical and record | = 25 |
| Test/s | = 20 |
| Regularity | = 5 |
| Total marks | = 50 |