DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHEME OF INSTRUCTION AND SYLLABI OF B.Tech. PROGRAM

RGUKT,Basar

II YEAR
II SEMESTER

Subject Code	Course Name	L-T-P	Credits
CS2201	Computer Organization and Architecture	4-0-0	4
CS2202	Formal Languages and Automata Theory	4-0-0	4
CS2203	Object Oriented Programming	4-0-0	4
MA2201	Probability and Statistics	4-0-0	4
CE2001/3001	Environmental Science	4-0-0	3
BM2101	Personality Development-I	2-0-0	1
CS2801	Computer Organization and Architecture Lab	0-0-3	2
CS2803	Object Oriented Programming Lab	0-0-3	2
CS2902	Seminar-II		1
Total		22-0-6	29

L-Lectures, T-Tutorials, P-Practicals, C-Credits

CS2201 COMPUTER ORGANIZATION AND ARCHITECTURE

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To understand how Computer Systems work & its basic principles
- To learn how to analyze the system performance.
- To understand the concepts behind advanced pipelining techniques.
- To learn the current state of art in memory system design
- To understand how I/O devices are being accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism

UNIT-I:

Basic functional blocks of a computer, Basic Functional blocks - CPU, Memory, Input-output, Control unit, Instructions and Instruction execution cycle, Instruction set architecture-Elements of machine instructions, Instruction representation, Instruction types, classification based on number of addresses, Data types, Types of operations-Data transfer, Arithmetic, Logical, Conversion, Input-output, system, Control and transfer of control operations, Addressing modes, Case study of 8086 instruction set.

UNIT-II:

Data representation and Arithmetic Data Representation: signed number representation, fixed and floating point representations, character representation. Converting between different bit lengths,

Integer arithmetic: Negation, integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication shift-and-add, and Booth multiplier. Division non restoring and restoring techniques, floating point: floating point representation and floating point arithmetic: Addition, Subtraction, Division, Multiplication

UNIT-III:

CPU control unit design Micro operations : fetch, indirect, interrupt, execute, Instruction cycle, Control Signals: inputs and outputs, Hard Wired Control Unit, Micro instructions: horizontal and vertical instruction formats, Micro program, Micro programmed control unit, Advantages and Disadvantages of hardwired and Micro programmed control unit Pipelining: Parallel processing, pipelining, Arithmetic pipelining, Instruction pipelining, RISC pipelining, throughput and speedup, pipeline hazards and solutions.

UNIT-IV:

Input-output organization External devices, Input -output Interface: I/O Bus and interface Modules, I/O Versus memory Bus, I/O Modules structure and their functions, Modes of Transfer: Programmed I/O, Interrupt driven I/O, Direct Memory Access: DMA Controller and Transfer, DMA Configurations, Privileged and Non-privileged instructions, Software Interrupts and exceptions, Processor modes: User mode and kernel mode.

UNIT-V:

Semi-conductor main memory & Memory organization Memory Hierarchy, Main Memory: Semi-conductor main memory, Organization of memory cell, RAM: DRAM, SRAM and ROM Chips, Memory Connection to CPU. Auxiliary memory: Disks, Read and write mechanisms, Data organization and formatting, Physical Characteristics, Disk performance parameters, Overview of optical discs, Memory Organization: Memory Interleaving, Cache memory, Cache memory principles, Mapping functions: Direct mapping, Associative mapping function, Set-Associative mapping function, Replacement Algorithms, Write policy.

Suggested References:

1. William Stallings, Computer Organization & Architecture, 6thdition, Pearson Education Asia
2. M.Morris Mano, Computer System Architecture,3rd edition, Pearson Education Asia
3. V.CarlHamacher, Z.G.Vranesic, S.G.Zaky, Computer organization, McGraw Hill.

CS2202 FORMAL LANGUAGES AND AUTOMATA THEORY

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- Understand basic properties of formal languages and formal grammars
- Understand basic properties of deterministic and nondeterministic finite automata
- Understand the relation between types of languages and types of finite automata
- Understand basic properties of Turing machines and computing with Turing machines
- Understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problems
- Understand the challenges for Theoretical Computer Science and its contribution to other sciences

UNIT-I:
Automata: Introduction to Finite Automata, Central Concepts of Automata Theory. Finite Automata: An Informal Picture of Finite Automata, Deterministic Finite Automata, Nondeterministic Finite Automata, An application, Finite Automata with Epsilon Transitions. Regular expressions & Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions.

UNIT-II:
Properties of Regular Languages: Proving Languages not to be Regular, Closure properties of Regular Languages, Decision Properties of Regular Languages, Equivalence and Minimization ofAutomata, Mealy and Moore Machine.

UNIT III:
Context Free Grammars and Languages: Context free grammars, Parses Trees, derivations, Applications, Ambiguity in Grammars and Languages, Normal Forms for Context Free Grammars:
CNF and GNF.Pushdown Automata: Definition, Languages of PDA, Deterministic Pushdown Automata.

UNIT-IV:
Equivalence of PDA's and CFG's, Pumping Lemma, Closure properties and Decision Properties ofCFL's.CFL and Regular language. Introduction to Turing Machines: Formal definition of TM, TM languages, Extensions to the Turing Machines, Restricted Turing Machines.

UNIT-V:
Church Turing thesis, Decidability, Reducibility, Un-decidability: Undecidable problems about Turing Machines, Post's Correspondence Problem, Halting problem and others. Intractable Problems: The Classes P and NP and NP Completeproblems.

Suggested References:

1. John. E. Hopcroft, Rajeev Motwani, Jeffery, D. Ulman, Introduction to Automata Theory,Languages and Computation, 3nd edition, Pearson Education-2007
2. ShyamalenduKandar, Introduction to Automata Theory, Formal Languages andComputation, 1st edition, Pearson Education India.
3. Michael Sipser. 1996. Introduction to the Theory of Computation (3rd ed.). CengageLearning, 2012.
4. Peter Linz, An Introduction to Formal Languages and Automata, Jones & BartlettPublishers, 2011.

CS2203 OBJECTED ORIENTED PROGRAMMING

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To be able to differentiate between structures oriented programming and object oriented programming.
- To be able to use object oriented programming language like Java and associated libraries to develop object oriented programs.
- To Able to understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using Java language.
- To be able to apply concepts of operator overloading, constructors and destructors.
- To be able to apply exception handling and use built-in classes

UNIT-1:

Introduction to OOPS: Paradigms of Programming Languages, Basic concepts of Object Oriented Programming, Differences between Procedure Oriented Programming and Object Oriented Programming, Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication, Benefits of OOP , Application of OOPs.

Java : History, Java features, Java Environment, JDK, API.

Introduction to Java : Types of java program, Creating and Executing a Java program, Java Tokens, Keywords, Character set, Identifiers, Literals, Separator, Java Virtual Machine (JVM), Command Line Arguments, Comments in Java program.

UNIT -2:

Elements: Constants, Variables, Data types, Scope of variables, Type casting, Operators: Arithmetic, Logical, Bit wise operator, Increment and Decrement, Relational, Assignment, Conditional, Special operator, Expressions – Evaluation of Expressions

Decision making and Branching: Simple if statement, if, else statement, Nesting if, else, else if Ladder, switch statement, Decision making and Looping: While loop, do, While loop, for loop, break, labelled loop, continue Statement.-, Simple programs

Arrays: One Dimensional Array, Creating an array, Array processing, Multidimensional Array, Vectors, Wrapper classes, Simple programs

UNIT-3:

Strings: String Array, String Methods, String Buffer Class, Simple programs

Class and objects: Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword, Command line input, Simple programs

Inheritance: Defining a subclass, Deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, Final classes, Finalizer methods, Abstract methods and classes, Visibility Control: Public access, Private access, friend, protected. Interfaces: Multiple Inheritance, Defining interface, Extending interface, Implementing Interface, Accessing interface variables, Simple programs

UNIT- 4:

Packages: Java API Packages, System Packages, Naming Conventions, Creating & Accessing a Package, Adding Class to a Package, Hiding Classes, Programs

Applets: Introduction, Applet Life cycle, Creating & Executing an Applet, Applet tags in HTML, Parameter tag, Aligning the display, Graphics Class: Drawing and filling lines, Rectangles, Polygon, Circles, Arcs, Line Graphs, Drawing Bar charts, Programs

AWT Components and Even Handlers: Abstract window tool kit, Event Handlers, Event Listeners, AWT Controls and Event Handling: Labels, TextComponent, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers- Input Events, Menus, Programs

UNIT-5:

Exception Handling: Limitations of Error handling, Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement

Multithreading: Creating Threads, Life of a Thread, Defining & Running Thread, Thread Methods, Thread Priority, Synchronization, Implementing runnable interface, Thread Scheduling.

I/O Streams: File, Streams, Advantages, The stream classes, Byte streams, Character streams.

JDBC, ODBC Drivers, JDBC ODBC Bridges, Seven Steps to JDBC, Importing java SQL Packages, Loading & Registering the drivers, Establishing connection. Creating &Executing the statement.

Suggested References:

1. Programming with Java - E. Balagurusamy
2. Java the complete reference, 7th editon, Herbert schildt, TMH.
3. Understanding OOP with Java, updated edition, T. Budd, pearsoneduction.
4. Object oriented Programming in Java - Dr. G.Thampi
5. Let us Java – Yashavant Kanetkar - BPB Publications, New Delhi - First Edition 2012

6. An Introduction to Oops with Java - C Thomas WU - TataMc-Graw Hill, New Delhi - 4th Edition
7. Object oriented Programming through Java - ISRD Group - TataMc-Graw Hill, New Delhi - Eight Reprint 2011

MA2201 PROBABILITY & STATISTICS

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-4**

Objectives:

- To understand the basic concept of counting, probability and its properties.
- To understand the concept of random variables and expectation.
- To learn various distributions and their applications.
- To study the properties of convergence of random variables.
- To know the concepts of statistics applicable in estimation and testing.

UNIT-I

Principles of Counting: Counting using Sum Rule and Product rule. Concepts of permutations, combinations and circular permutations. Pigeonhole Principle, Occupancy Problem.

Basic Probability: Random experiment. Sample space. Mutually exclusive events. Empirical definition of probability. Problems based on probability. Axiomatic definition of probability. Properties based on axiomatic definition of probability. Conditional probability. Independent events.

Bayes' Theorem and Applications: Bayes' Theorem and problems based on conditional probability.

UNIT-II

Random Variables: Definition of random variables. Properties of discrete and continuous random variables.

Probability Distributions and Probability Densities: Definition and properties of probability mass function and probability density function. Definition of cumulative distribution function and its properties for discrete and continuous distributions.

Multivariate Distributions: Definition and properties of multivariate distribution (continuous and discrete). Joint probability distributions. Marginal probability distributions. Conditional probability distributions.

Mathematical Expectation: Concept of mathematical expectation of functions of random variables and their significance.

UNIT-III

Discrete Distributions: Properties of various discrete distributions: Binomial, Poisson, Negative Binomial, Geometric, Hypergeometric and Discrete uniform distributions.

Continuous Distributions: Properties of various continuous distributions: Uniform, Exponential, Normal, Gamma distributions.

Functions of Random Variables: Evaluating probability distribution of functions of random variables using CDF technique. Determination of joint probability distribution of functions of random variables using transformations. Using transformations to evaluate the distribution of functions of random variables.

Moments and Moment Generating Functions: Moments about origin, Central moments. Moment generating functions of random variables and its properties.

UNIT-IV

Covariance and Correlation: Definition and properties of covariance and correlation. Definition of bivariate normal distributions. Properties of its marginal distributions.

Inequalities and Limit Theorems: Chebychev's inequality, Cauchy Schwarz inequality. Convergence in probability. Central limit theorem.

Ordered Statistics: Probability distributions of ordered statistics and their properties.

UNIT-V

Measures of Central Tendency: Mean, median and mode for grouped and ungrouped data. Quartiles, variance and percentiles for given data.

Sampling and Estimation of Parameters: Concepts of sampling and estimation of mean and variance of a distribution form the sample.

Linear Regression: Linear regression for relationship between two variables.

Hypothesis Testing: Formulation of hypothesis and alternate hypothesis. One-sided and two-sided tests.Comparison of means.

Suggested References:

1. Miller, I., Miller, M., John E. Freund's Mathematical Statistics with Applications (7^{th} Edition), Pearson Education, Inc., 2009.
2. Ross, S.M., Introduction to Probability and Statistics for Engineers and Scientists (4^{th} Edition), Academic Press, 2011.
3. Gupta, S.C., Kapoor V.K., Fundamentals of Mathematical Statistics (11^{th} Edition), Sultan Chand & Sons, 2002.
4. Gupta, A., Groundwork of Mathematical Probability and Statistics (5^{th} Edition), Academic Publishers, 2002.
5. Feller, W., An Introduction to Probability Theory and its Applications, Volume 1 (3^{rd} Edition), John Wiley & Sons, Inc., 1967.
6. Feller, W., An Introduction to Probability Theory and its Applications, Volume 2 (2^{nd} Edition), John Wiley & Sons, Inc., 1971.

CE2001/3001 ENVIRONMENTAL SCIENCE

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **4-0-0-3**

Objectives:
Learning Objectives:
The syllabus aims to:

- Stimulate interest in the environment and endeavors to generate awareness about environmental concerns among students.
- Develop an understanding of how natural resources and the environment affect quality of life and the quest for sustainable development.
- Develop knowledge and understanding of environmental issues and principle and apply their knowledge to mitigate the environmental problems.
- Understand and resolve some of today's most challenging scientific and policy issues—including global climate change, pollution, biodiversity conservation, sustainability, environmental pollution and toxic waste disposal, disease control, disaster management, socio-environmental issues and balancing resource use and preservation.
- Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments.
- Recognizes the global changes and responses for attaining a more sustainable environment.

UNIT 1: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES
Definition, scope and importance, need for public awareness.

UNIT 2: NATURAL RESOURCES:
Renewable and non-renewable resources : Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
d) Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- .Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

UNIT 3: ECOSYSTEMS & BIODIVERSITY

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 ecosystems:-
a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem, d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

b. Biodiversity- Definition : genetic, species and ecosystem diversity. Biogeographical classification of India Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.

c. Biodiversity at global, National and local levels. Inida as a mega-diversity nation Hot-sports of biodiversity.

d. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT 4: ENVIRONMENTAL POLLUTION

Definition, Cause, effects and control measures of :- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards

- Solid waste Management: Causes, effect s 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.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Environment Protection Act., Air (Prevention and Control of Pollution) Act. Water Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act .

UNIT 5 : SOCIAL ISSUES & THE ENVIRONMENT

Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.
Field work: Visit to a local area to document t environmental assets river/ forest/grassland/hill/mountain Visit to a local polluted site-Urban/Rural/Industrial/Agricultural . Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCES :

a). Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
b). Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad- 380 013, India, Email:mapin@icenet.net (R)
c). Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
d) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
e). Cunningham, W.P. Cooper, T.H. Gorhan i, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 116p .

BM2101 PERSONALITY DEVELOPMENT-I

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **2-0-0-1**

Guidelines: Learning approach is based on Real time case studies with class room activities

Course Objectives:

1. To develop interpersonal skills and be an effective goal oriented team player.
2. To develop professionals with idealistic, practical and moral values.
3. To develop communication and problem solving skills.
4. To re-engineer attitude and understand its influence on behavior.
5. To enhance holistic development of students and improve their employability skills.

UNIT I-SELF ANALYSIS (6 hours)

SWOT Analysis, Who am I, Personality Traits, Importance of Self Confidence, Self Esteem.

UNIT II-GOALS SETTINGS (6 hours)

Short term , Long term goal settings, SMART concept
Diversifying Risk and Optimizing Opportunities

UNIT III- TEAM DYNAMICS WITH INTERPERSONAL SKILLS (8 hours)

Team Dynamics, Team Work, Interpersonal Skills

Behavioral Skills GD, PI, Body Language Public Speaking, Verbal, Non Verbal Communications

UNIT II-CREATIVITY and Rationality (8 hours)

Out of Box thinking, Idea Generation with creativity

Brain Storming, Effective group meetings, Rationalization of ideas and way to effective implementation

.Class room and team activities coupled with group tasks depending upon time availability

CS2801 COMPUTER ORGANIZATION AND ARCHITECTURE LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

This course concentrates on the practical part of Computer Organization by using Assembly language. This course allows students to practice writing programs based on the concepts the will learn through the course by giving the students different types of problems to be solved using an emulator.

Objectives:

- Teach students basic principles about computer architecture, machine language, and low-level programming.
- Teach students enough assembly language to enhance their knowledge on today's most widely used microcomputer family.
- Improving students systems programming skills through programming exercises carried out by students.
- Students are expected to implement solutions to problems using the concepts they will take through the course.

Experiments:

1. Basic Concepts
2. Assembly Language Fundamentals
3. Data Transfers, Addressing, and Arithmetic
4. Procedures
5. Conditional Processing
6. Integer Arithmetic
7. Strings and Arrays
8. 16-Bit MS-DOS Programming

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2201 can be substituted

CS2803 OBJECTED ORIENTED PROGRAMMING LAB

Externals: 60Marks **L-T-P-C**
Internals: 40Marks **0-0-3-2**

Objectives:

- To be able to apply an object oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
- To be able to reuse the code and write the classes which work like built-in types.
- To be able to design applications which are easier to debug, maintain and extend.
- To be able to apply object-oriented concepts in real world applications.

Experiments:

1. A program to illustrate the concept of class with constructors, methods and overloading.
2. A program to illustrate the concept of inheritance and dynamic polymorphism.
3. A program to illustrate the usage of abstract class.
4. A program to illustrate multithreading.
5. A program to illustrate thread synchronization.
6. A program to illustrate Exception handling.
7. A program to illustrate user-defined Exceptions
8. A program to demonstrate use of User-defined Packages.
9. A program using String Tokenize.
10. A program using Linked list class
11. A program using Tree Set class
12. A program using Hash Set and Iterator classes
13. A program using Map classes.
14. A program using Enumeration and Comparator interfaces.
15. A program using File and Filename Filter
16. A program to illustrate the usage of Byte and Character I/O streams.
17. A program to illustrate the usage of Serialization.
18. Program using Data class.\
19. An application involving GUI with different controls, menus and event handling.
20. A program to implement an applet.

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2203 can be substituted

CS2902 **Seminar-II**

Externals: 100 marks **L-T-P-C**
0-0-2-1

Objectives:

- To improve the presentation skills
- To prepare PPT more effectively

Student has to chose a topic related socio-economic matter to give a power point presentation.