UNDER GRADUATE DEGREE COURSE

B.TECH

in

COMPUTER SCIENCE & ENGINEERING

[W.E.F. 2020-21]

(Scheme and Syllabus for :: 2nd Year 1st & 2nd Semesters)

DEPARTMENT OF
COMPUTER SCIENCE AND SYSTEMS ENGINEERING
AU COLLEGE OF ENGINEERING (AUTONOMOUS)
ANDHRA UNIVERSITY
VISAKHAPATNAM-530 003

ANDHRA UNIVERSITY: : VISAKHAPATNAM
COMMON SCHEME OF INSTRUCTION & EXAMINATION
II/IV B.TECH (FOUR YEAR COURSE) &
II/VI B.TECH (SIX YEAR DOUBLE DEGREE COURSE)
(With effect from **2020-2021** admitted batch onwards)

B.TECH. (CSE) II YEAR I-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2101	BS	Probability, Statistics And Queuing Theory	3	1	0	30	70	100	3
CS 2102	PC	Elements of Electronics Engineering	3	1	0	30	70	100	3
CS 2103	PC	Computer Organization And Architecture	3	1	0	30	70	100	3
CS 2104	PC	Operating Systems	3	1	0	30	70	100	3
CS 2105	PC	Object Oriented Programming through Java	3	1	0	30	70	100	3
CS 2106	PC	Computer Organization Lab	0	0	3	50	50	100	1.5
CS 2107	PC	Object Oriented Programming (through Java) Lab	0	0	3	50	50	100	1.5
CS 2108	PC	Operating Systems Lab	0	0	3	50	50	100	1.5
CS 2109	SC(MC)	Intellectual Property Rights	1	0	2	50	50	100	2
CS 2110	MC	Environmental Science	0	0	0	-	100	100	0
Total Credits									**21.5**

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B.TECH. (CSE) II YEAR II-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2201	ES	Microprocessors	3	1	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	3	1	0	30	70	100	3
CS2203	PC	Database Management Systems	3	1	0	30	70	100	3
CS2204	PC	Formal Languages and Automata Theory	3	1	0	30	70	100	3
CS2205	HSS	Managerial Economics	3	1	0	30	70	100	3
CS2206	PC	Algorithms Lab	0	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	0	3	50	50	100	1.5
CS 2208	SC	Java Technologies	1	0	2	50	50	100	2
CS2209	MC	Professional Ethics And Universal Human Values	0	0	0	0	100	100	0
CS2210	MC	NSS / NCC	0	0	2	-	-	-	0
Total Credits									**20**
Summer Internship (Community Service)									

CS 2101	PROBABILITY, STATISTICS & QUEUING THEORY *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, **Univ. Exam: 3 Hours**		**Credits: 3**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course objectives

1. to provide foundations of probabilistic and statistical analysis
2. to provide an understanding on concepts of probability, random variables, probability distributions, sampling, estimation, hypothesis testing, regression, correlation, multiple regression, hypothesis testing, sample test, queuing methods
3. to explore applications of probabilistic and statistical tools to solve real world problems.

Course outcomes

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

1. define and explain basic concepts in probability theory and how to translate real-world problems into probability models
2. solve standard problems that include random variables, discrete and continuous probability distributions
3. perform Test of Hypothesis and construct a confidence interval to estimate population parameters
4. compute and interpret the results of Correlation Analysis, Multivariate Regression, Chi-Square test for Independence and Goodness of Fit
5. explain basic concepts in Markov processes, M/M/1 and M/M/C queueing systems.

Syllabus

1. **Probability:** Definitions of probability, Addition theorem, Conditional probability, Multiplication theorem, Bayes‟ Theorem of Probability and Geometric Probability.
2. **Random variables and their properties**: Discrete Random Variable, Continuous Random Variable, Probability Distribution, Joint Probability Distributions their Properties, Transformation Variables, Mathematical Expectations, Probability Generating Functions.
3. **Probability Distributions**: Discrete Distributions : Binomial, Poisson Negative Binominal Distributions And Their Properties; Continuous Distributions : Uniform, Normal, ExponentialDistributions And Their Properties.
4. **Multivariate Analysis** : Correlation, Correlation Coefficient, Rank Correlation, Regression Analysis, Multiple Regression, Attributes, Coefficient Of Association, Chi Square Test For Goodness Of Fit, Test For Independence.
5. **Estimation**: Sample, Populations, Statistic, Parameter, Sampling Distribution, Standard Error, Un-biasedness, Efficiency, Maximum Likelihood Estimator, Notion & Interval Estimation.
6. **Testing of Hypothesis**: Formulation of Null hypothesis, critic al region, level of significance, power ofthe test;
7. **Sample Tests**: Small Sample Tests : Testing equality of .means, testing equality of variances, test of correlation coefficient, test for Regression Coefficient; Large Sample tests: Tests based on normal distribution

8. **Queuing Theory** : Queue description, characteristics of a queuing model, study state solutions of M/M/1: Model, M/M/1 ; N Model, M/M/C: Model, M/M/C: N Model , Case studies

Text Books

1. Probability & Statistics for Engineers and Scientists,Walpole, Myers, Myers, Ye. Pearson Education.
2. Probability, Statistics and Random Processes T.Veerarajan Tata McGraw – Hill

Reference Book

1. Probability & Statistics with Reliability, Queuing and Computer Applications, Kishor S. Trivedi,Prentice Hall of India ,1999

CS 2102	**ELEMENTS OF ELECTRONICS ENGINEERING** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week,	**Univ. Exam: 3 Hours**	**Credits: 3**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course Objectives

1. Introduce students to basics of semiconductors, their classification and properties
2. To provide theory of PN junction diode, its characteristics and applications
3. To introduce basics of rectifying circuits and bipolar junction transistor
4. To provide basics of transistor biasing, transistor amplifiers and field effect transistors

Course Outcomes

By the end of the course, the student should be able to:

1. Explain the basics of semiconductors and their classification
2. Understand the theory of PN junction diode, rectifying circuits and bipolar junction transistor
3. Explain the concepts of transistor biasing, transistor amplifiers and field effect transistors

1. **Introduction to Electronics and Semiconductors:** Energy band theory, Conduction inInsulators, Semiconductors and metals, Electron emission from metals, Classification of semiconductors, Carrier concentration in an intrinsic semiconductor, Properties of intrinsic semiconductor, Drift and diffusion currents.
2. **Semi Conductor Diode:**Theory of PN junction diode, Open circuited PN junction, V-Icharacteristics of a PN diode, Diode current equation, Transition and diffusion capacitances, Break down in PN diode, Applications of PN diodes. Zener diode, Zener regulator, Tunnel diode, Schottky diode.
3. **Rectifying circuits:** Half wave and full wave rectifiers, Bridge rectifiers, Efficiency, Ripple andregulation of each rectifier, Capacitor filters.
4. **Bipolar Junction Transistor** :– Introduction, construction, Operation of PNP and NPNTransistors – Transistor Circuit configurations- Characteristics of a CE configurations – h parameters, low frequency small signal equivalent circuit of a Transistor.
5. **Transistor Biasing and thermal stabilization:** Transistor Biasing, Stabilization, Differentmethods of transistor biasing – Fixed bias, Collector feedback bias – self bias – Bias compensation.
6. **Transistor Amplifiers:** CE, CB, CC amplifier configurations –Multistage amplifier – A Two StageRC coupled amplifier – frequency response curve and bandwidth**.**
7. **Field Effect Transistors:** Junction Field Effect Transistors (JFET) – JFET characteristics, JFETParameters, Small signal equivalent circuit – MOSFETS – Depletion and Enhancement MOSFETS.

Text Books:

1. Electronic Device and Circuits by Sanjeev Guptha.

Reference Books:

1. Electronic Device and Circuits Theory by Robert L. Boylested Electronic Device and Circuits by David. A. Bell

CS 2103	COMPUTER ORGANIZATION AND ARCHITECTURE *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week,	**Univ. Exam: 3 Hours**	**Credits: 3**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course Objectives:

1. To study about structure and functional components of a computer.
2. Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
3. Learn about the architecture of a computer from a programming view.
4. To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes:

1. Knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
2. Detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
3. simple and multiple processor organization and their issues.

Syllabus:

1. **Register Transfer and Micro operations:** Register Transfer Language, Register Transfer,Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic ShiftUnit.

2. **BasicComputerOrganizationandDesign:**InstructionCodes,ComputerRegisters,Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions,Input-OutputandInterrupt,CompleteComputerDescription,DesignofBasicComputer,Designof AccumulatorLogic.

3. **Micro programmed Control**: Control Memory, Address Sequencing, Micro programExample, Design of ControlUnit.

4. **Central Processing Unit:** Introduction, General Register Organization, StackOrganization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, ProgramControl, Reduced Instruction Set Computer(RISC), Architecture and Programming of 8085Microprocessor.

5. **Pipeline and Vector Processing:** Parallel Processing, Pipelining, Arithmetic Pipeline,Instruction Pipeline, RISK Pipeline, Vector Processing, ArrayProcessors.

6. **Input/output Organization:** Peripheral Devices, I/O interface, Asynchronous datatransfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor(IOP), Serial Communication.
7. **Memory Organization**: Memory Hierarchy, Main memory, Auxiliary memory,Associate Memory, Cache Memory, and Virtual memory, Memory ManagementHardware.

TextBooks:

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., ThirdEdition, Sept. 2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S Gaonkar

ReferenceBooks:

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., EasternEconomy Edition, Sixth Edition,2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

CS 2104	**OPERATING SYSTEMS** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 4**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course objectives:

1. To understand evolution of Operating System.
2. To understand operating system as a layer of abstraction above physical hardware that facilitates usage convenience and efficient resource management of computer system resources.
3. To learn design and implementation of policies and mechanisms for OS subsystem.
4. To investigate case studies to understand the design philosophies / paradigm for popular multiuser or single user operating system.

Course Outcomes:

1. The student understands OS evolution, its structure and services provided by it.
2. Learn process life cycle, process scheduling objectives, policies and mechanisms, process synchronization, inter process communication, deadlocks and other process subsystem related concepts.
3. Learn memory hierarchy, allocation and deallocation policies and mechanism for main and auxiliary memory, file system design and implementation issues.
4. investigate UNIX/ LINUX and Windows OS platforms w.r.t similarities and differences in design philosophies.

Syllabus:

1. **Introduction to Operating Systems**: Over View of Operating Systems, Types of Operating Systems, Operating System Structures, Operating System Services, System Calls, Virtual Machines, Operating System Design and Implementation.

2. **Process Management**: Process Concepts, Operations on Processes, Cooperating Processes, Threads, Inter Process Communication, Process Scheduling, Scheduling Algorithms, Multiple-Processor Scheduling, Thread Scheduling.

3. **Process Synchronization:** The Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors.

4. **Deadlocks**: System Model, Deadlock Characterization, Methods For Handling Deadlocks, Deadlock Prevention, Avoidance, Deadlock Detection, Recovery from Deadlocks

5. **Memory Management:** Logical versus Physical Address, Swapping, contiguous memory allocation, paging, structure of the page table , segmentation, Virtual Memory, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped files

6. **FileSystems,Implementation,andSecondary-storageStructure:**Conceptofafile,Access Methods, Directory Structure, Protection, File System Structure, Allocation Methods, Free Space Management, Directory Management, Device Drivers, overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, swap-space management.

7. **Case study:** Overview of LINUX, Windows Operating systems

TextBook:

1. Operating Systems, Abraham Silberschatz, Peter Baer Galvin, and GregGagne, John Wiley Publ., SeventhEdition.
1. Operating Systems;A Practical Approach.Rajiv Chopra**.**

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, ,2nd edition, 1995,PHI.
2. Operating Systems, William Stallings 5th Edition -PHI
3. Operating Systems: A Design-Oriented Approach', Charles Crowley, 'TataHill Co.,1998 edition.

CS2105	**OBJECT ORIENTED PROGRAMMING through JAVA** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods+1Tut/week, Univ. Exam: 3 Hours		**Credits: 4**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Learning Objectives:

- This subject will help to improve the analytical skills of object oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Learning Outcome:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi-threaded programming, and event-driven programming.

Syllabus:

1. **Introduction to Java :**

   Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

2. **Objects and Classes** :

   Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

3. **Inheritance and Polymorphism** :

   Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interfacein java, Package in java, UTIL package.

4. **Event and GUI programming** :

   Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons,Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

5. **I/O programming** :

   Text and Binary I/O, Binary I/O classes, Object I/O, RandomAccess Files.

6. **Multithreading in java** :

   Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally,Collections in java, Introduction to JavaBeans and NetworkProgramming.

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, SeventhEdition, Pearson.
2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford UniversityPress.
3 Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.
4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, PearsonEducation.
5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.
6 Java Programming, D. S. Malik, Cengage Learning.

CS 2106	**DIGITAL ELECTRONICS & MICROPROCESSORS LAB** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 2**
Internal: 50 Marks	**University Exam: 50 Marks**	**Total: 100 Marks**

Course Objective:

1. To learn the about logic gates, half adders, full adders and flip -flops.
2. To learn about the microprocessor programming.
3. To learn about the microprocessor interfacing with stepper motor, R-2R ladder.

Course Outcomes:

1. The student understands the logic gates, half adders, full adders and flip-flops to design a circuit.
2. The student develops the skill of writing microprocessor programming.
3. The student understands the interfacing of microprocessor with stepper motor, R-2R ladder.

1. DIGITAL EXPERIMENTS

a. Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR gates (By using 7400-series)
b. Construction of gates using NAND, NOR gates.
c. Construction of Half and Full adders and verifying their truth tables.
d. Operation and verifying truth tables of flip- flops- RS, D, and JK using ICs.
e. Construction of Decade counters (7490).
f. 4-bit parallel adder using combinational circuits.
g. Decade counter using JK flip flops.
h. Up/Down counter using JK flip flop.
i. Up/Down counter using 7493.

2. MICROPROCESSOR (Intel 8085) Programming

a. Binary addition & subtraction. (8-bit & 16-bit)
b. Multiplication & division.
c. Picking up largest/smallest number.
d. Arranging –ascending/descending order.
e. Decimal addition (DAA) & Subtraction.
f. Time delay generation

Text Book:

8. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh Gaonkar
9. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., ThirdEdition, Sept. 2008.

CS 2107	**OBJECT ORIENTED PROGRAMMING Through JAVA LAB** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week,	**Univ. Exam: 3 Hours**	**Credits: 1.5**
Internal: 50 Marks	**University Exam: 50 Marks**	**Total: 100 Marks**

Course Objectives:

1. To develop programs using basic OOPS concepts such as classes and objects.
2. To implement programs using Inheritance concepts.
3. To implement programs using Exception handling.
4. To develop programs using operator overloading concepts.

Course Outcomes:

1. Student will be able to use OOPs concepts.
2. Ability to apply Inheritance concepts to several problems.
3. Ability to use Exception Handling concepts.

List of Programs:

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Network Programming.
11. Program to demonstrate Applet structure and event handling.
12. Program to demonstrate Layout managers.

CS 2108	**OPERATING SYSTEMS LAB** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 1.5**
Internal: 50 Marks	**University Exam: 50 Marks**	**Total: 100 Marks**

Course Objectives:

1. To learn about UNIX/LINUX operating system, its intervals.
2. To learn system programming for UNIX/LINUX Operating System.
3. To understand UNIX/LINUX shell and its programming.
4. To understand resource management policies and mechanisms and their performance evaluation.

Course Outcomes:

1. The student practices UNIX commands, Vi editor, shell commands.
2. The student develops skill in writing C programs using system calls for process management, inter process communication and other aspects.
3. The student learns shell programming and develops skill for writing scripts for batch level tasks.
4. The student learns to simulate OS resource management aspects like process scheduling , page replacement and others to evaluate performance.

Module I

1. OS lab familiarization, Home Assignment on Unix commands, Vi editor
2. Simple C programs using command line arguments, system calls, library function calls, make utility
3. C programs using fork system call to create processes and study parent, child process mechanism
4. C programs to create process chaining, spawning
5. C programs to handle errors using errno, perror() function
6. C programs to use pipe system call for inter process communication

Module II

1. Familiarization of Unix shell programming
2. Simple shell programming exercises
3. Shell programming using decision making constructs
4. Shell programming using loop constructs
5. Shell programming for file and directory manipulation

Module III

1. C programs to study process scheduling implementing FCFS, Shortest Job First, and Round Robin algorithms

2. C programs to study page replacement implementing FIFO, Optimal, and LRU page replacement algorithms
3. C programs to study deadlock avoidance and detection
4. C Programs to simulate free space management

References:

1. Unix concepts and applications by Sumitabha Das,

   TMH Publications.
2. Unix programming by Stevens, Pearson Education.
3. Shell programming by YashwanthKanetkar.
4. Operating SystemConcepts by Silberschatz, and Peter Galvin.

CS 2109	INTELLECTUAL PROPERTY RIGHTS *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 2**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course Objective:

1. To introduce the students to Intellectual Property Rights (IPR) which is a key component in modern knowledge management processes
2. To create consciousness on IPR in students at an early stage of their education so that they develop an appreciation for ethical and rightful use of existing knowledge
3. To make them understand how to take ownership of knowledge they may develop as a result of their creative innovations, take ownership and either drive themselves in becoming entrepreneurs or become responsible knowledge users in society
4. To expose students some of the recent debates on the societal implications of IPR and itsrole in national/international trade and socio-economic development.

Course outcome:

Learners will be able to

1. identify the types of intellectual property protection available for their research outcome
2. conduct patent search and analyze patentability of the invention
3. understand the basic structure of Patent document
4. understand the registration and prosecution of different IPs
5. understand the basics of IP commercialization and techno/commercial/legal issues in IPRcommercialization

Syllabus

1. **Introduction**
   Concept of property, Intellectual Property (IP) and Intellectual Property Rights (IPR), Importance of IP, Value creation through IP, Advantages of IP protection, Competitive advantage, Promotion of social good, Prevention of duplicates, counterfeit products and IP
2. **Evolution of IP system**
   Historical view of IP system in India and abroad, Legal basis and rationale behind development of IP system, WTO and TRIPS agreement, Role of WIPO
3. **Types of IPR**
   Major forms of IP in India and globally, Acts enacted in India related to IP
4. **Patent**
   Concept, Life of patent, Rights of Patentee, Criteria of patentability- novelty, non-obviousness, and utility, Non-patentable inventions
5. **Patent filing and prosecution**

Prior art search, Process of obtaining a patent in India, Provisional and complete specification, Convention application, Patent Cooperation Treaty (PCT), Patent Infringement and Enforcement

6. **Trademark**
   Types of trademarks, Trademark and Brand, Trademark Registration, Trademark Infringement
7. **Copyright**
   Copyrights and related rights, Copyright registration, Copyright infringement,Section 52 of Indian Copyright Act
8. **Industrial Design**
   What is Industrial design, Design registration, Design infringement
9. **Trade Secret**
   What are Trade Secrets, How trade secrets are maintained in trade and business
10. **Other forms of IP**
    Semiconductor Integrated Circuits Layout Design, Geographical Indications, Protection of Plant Varieties & Farmers' right, Traditional knowledge
11. **IP commercialization**
    Licensing & Royalty; Technology Transfer; IP assignment, Compulsory License
12. **Emerging areas**
    Patinformatics, IP and bank loan, IP insurance, IP audit, IP valuation, IP management, Use of artificial intelligence in IP enforcement, Open innovation

Text Books

1. Ganguli Prabuddha, Gearing up for Patents The Indian Scenario", Universities Press (1998)
2. Ganguli Prahuddha "Intellectual Property Rights-Unleashing the Knowledge Economy". Tata McGraw Hill (2001)
3. Geographical Indications of Goods Act 1990 Ganguli Piabaddha "Geographical Indications-its evolving contours accessible in http ips.nminsoda/files/2012/05/main book pdf (2009)

Reference Books

1. Ganguli Prabuddha and Jahade Siddharth, "Nanotechnology Intellectual Property Rights Research, Design, and Commercialisation", CRC Press, Taylor and Francis Group, USA (2012)
2. Beyond Intellectual Property: Toward Traditional Resource Rights for Indigenous Peoples and Local Communities [Paperback J,Darrell A. Posey and Graham Dotfield, IDRC Books; annotated edition (June (1996)
3. Netancl Neil Weinstock, Copyright's Paradox, Oxford University Press (2010)
4. The Indian Patents Act 1970 (as amended in 2005)
5. The Indian Copyright Act 1950 as amended in 2017)
6. Indian Trademarks Act 1999
7. The Indian Industrial Designs Act 2000
8. The Protection of Plant Varieties andFarmers' Right Act 2001
9. Inventing the Future: An Introduction to Patents for small and medium sized enterprises, WIPOpublication No 917 www.wipo.int/ebookshop
10. Looking Good: An Introduction to Industrial Designs for Small and Medium sized Enterprises; WIPOpublication No.498 www.wipo.int/ebookshop

CS 2110	**ENVIRONMENTAL SCIENCE** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 2Periods/week, Univ. Exam: 3 Hours		**Credits: 0**
Internal: 0 Marks	**University Exam: 100 Marks**	**Total: 100 Marks**

Course Objectives

The objectives of the Environmental Science course are to

- Familiarize the fundamental aspects of environment and the environmental management'
- Provide information of some of the important international conventions which will be useful during the future endeavors after graduation.
- Make realize the importance of natural resources management for the sustenance of the life and the society.
- Apprise the impact of pollution getting generated through the anthropogenic activities on the environment
- Provide the concept of Sustainable Development, energy and environmental management
- Impart knowledge on the new generation waste like e-waste and plastic waste.

Course Outcomes

After completion of the course the students will have

- Knowledge on the fundamental aspects of environment and the environmental management
- The knowledge on the salient features of the important international conventions
- Understanding of the importance of natural resources management for the sustenance of the life and the society.
- Familiarity on various forms of pollution and its impact on the environment.
- Understand the elements of Sustainable Development, energy and environmental management
- Knowledge on the new generation waste like e-waste and plastic waste.

SYLLABUS

1. **Introduction:** Structure and functions of Ecosystems-Ecosystems and its Dynamics-Value of Biodiversity-impact of loss of biodiversity, Conservation of bio-diversity. Environmental indicators - Global environmental issues and their impact on the ecosystems.
   Salient features of International conventions on Environment: Montreal Protocol, Kyoto protocol, Ramsar Convention on Wetlands, Stockholm Convention on Persistent Organic Pollutants, United Nations Framework Convention on Climate Change (UNFCCC),

2. **Natural Resources Management:** Importance of natural resources management-Land as resource, Land degradation, Soil erosion and desertification, Effects of usage of fertilizer, herbicides and pesticide- watershed management.

3. **Forest resources:** Use and over-exploitation, Mining and dams – their effects on forest ecosystems and the living beings.

4. **Water resources:** Exploitation of surface and groundwater, Floods, droughts, Dams:benefits and costs.

5. **Mineral Resources:** Impact of mining on the environment and possible environmental management options in mining and processing of the minerals.
   Sustainable resource management (land, water, and energy), and resilient design under the changing environment.
6. **Environmental Pollution:** Local and Global Issues. Causes, effects and control measures. Engineering aspects of environmental pollution control systems.

7. **Air pollution:** impacts of ambient and indoor air pollution on human health. Water pollution: impacts water pollution on human health and loss of fresh water resources. Soil pollution and its impact on environment. Marine pollution and its impact on blue economy. Noise pollution.

8. **Solid waste management:** Important elements in solid waste management- Waste to energy concepts. Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act and their amendments. Salient features of Environmental protection Act, 1986.

9. **Sustainable Development:** Fundamentals of Sustainable Development– Sustainability Strategies and Barriers – Industrialization and sustainable development. Circular economy concepts in waste (solid and fluid) management.

10. **Energy and Environment:** Environmental Benefits and challenges, Availability and need of conventional energy resources, major environmental problems related to the conventional energy resources, future possibilities of energy need and availability. Solar Energy: process of photovoltaic energy conversion, solar energy conversion technologies and devices, their principles, working and applications, disposal of solar panel after their usage. Biomass energy: Concept of biomass energy utilization, types of biomass energy, conversion processes, Wind Energy, energy conversion technologies, their principles, equipment and suitability in context of India.

11. **Management of plastic waste and E-waste**: Sources, generation and characteristics of various e- and plastic wastes generated from various industrial and commercial activities; Waste management practices including onsite handling, storage, collection and transfer. E-waste and plastic waste processing alternatives. E-Waste management rules and Plastic waste management rules, 2016 and their subsequent amendments.

Text Books:

1. Bharucha,Erach (2004). Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education, University Grants Commission, New Delhi.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Masters, G. M., &Ela, W. P. (1991). Introduction to environmental engineering and science. Englewood Cliffs, NJ: Prentice Hall.
4. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.

Reference Books:

1. Sharma, P. D., & Sharma, P. D. (2005). Ecology and environment. Rastogi Publications
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Clark R.S. (2001). Marine Pollution, Clanderson Press Oxford (TB)
4. Jadhav, H & Bhosale, V.M. (1995). Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
5. MoEF&CC, Govt. of India, CPCB: E-waste management rules, 2016 and its amendments 2018.
6. MoEF&CC, Govt. of India, CPCB: Plastic waste management rules, 2016.

COMMON SCHEME OF INSTRUCTION & EXAMINATION
II/IV B.TECH (FOUR YEAR COURSE) &
II/VI B.TECH (SIX YEAR DOUBLE DEGREE COURSE)
(With effect from **2020-2021** admitted batch onwards)

B.TECH. (CSE) II YEAR II-SEMESTER SCHEME OF INSTRUCTION AND EXAMINATION

Course code	Category	Course Title	Hours per week			Internal Marks	External Marks	Total Marks	Credits
			L	T	P				
CS2201	ES	Microprocessor	3	1	0	30	70	100	3
CS2202	PC	Design and Analysis of Algorithms	3	1	0	30	70	100	3
CS2203	PC	Database Management Systems	3	1	0	30	70	100	3
CS2204	PC	Formal Languages and Automata Theory	3	1	0	30	70	100	3
CS2205	HSS	Managerial Economics	3	1	0	30	70	100	3
CS2206	PC	Algorithms Lab	0	0	3	50	50	100	1.5
CS2207	PC	Database Management Systems Lab	0	0	3	50	50	100	1.5
CS 2208	SC	Java Technologies	1	0	2	50	50	100	2
CS2209	MC	Professional Ethics And Universal Human Values	2	0	0	-	100	100	0
CS2210	MC	NSS / NCC	0	0	2	-	-	-	0
Total Credits									**20**
Summer Internship (Community Service)									

CS2201	MICROPROCESSORS	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 3**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course Objectives:

1. To discuss the architectures of 8085, 8086 microprocessors, their instruction sets and related ALP programs.
2. To discuss interfacing semiconductor memories, interfacing peripheral to Intel 8086.
3. To study interfacing data converters to 8086 and discuss about micro controller 8051 architecture.

Course Outcomes:

1. Understand the basic architectures of 8085 and 8086 microprocessors.
2. Ability to write ALP programs using instruction sets.
3. Understand the various interfacing concepts and micro controllers.

Syllabus:

1. **Introduction to Microprocessors and Microcomputers:** A Brief Architecture and Programming of 8085Microprocessor.
2. **Architecture**: Instruction Set and Programming of 8086Microprocessor
3. **Interfacing Semiconductor Memories and I/O Devices**: Semiconductor Memories:ClassificationInternal Organization& Functional Description, Interfacing SRAMs and EPROMs to8086, Interfacing Characteristics of I/Devices, I/O Device addressing methods, I/O DeviceProgramming Methods.
4. **Interfacing Peripherals to Intel8086 -1:** Parallel I/O Interface- 8255,Serial I/O Interface –8251, Timer Interface -8253/8254
5. **Interfacing Peripheral to Intel8086 -2:**Keyboard/Display Interface-8279,InterruptControllerInterface–8259
6. **Interfacing Data Converters to 8086:** D/A Conversion Methods, A/D Conversionmethods, Interfacing DAC, InterfacingADC.
7. **Introduction to Micro controllers:** Intel 8051Architecture andProgramming

TextBooks:

1. Microprocessor Architecture, Programming, and Applications with the8085 Ramesh S.Gaonkar, 4th Edition, PenramInternational,1999
2. The 80x86 Family, Design, Programming and Interfacing, John E.Uffenbeck, 3rd Edition,Pearson Education Inc.,2002
3. KennethJ.Ayala, 8051 Microcontroller Architecture, Programming AndApplications,2nd Edition, Penram InternationalPublications,1999

Reference Books:

1. BARRYB.BREY,TheIntelMicroprocessors8086/8088,80186/80188,80286,80386and 80486,Pentium, PentiumPro Processor, Pentium II, Pentium III, Pentium 4, Architecture,ProgrammingandInterfacing,8th Edition,PearsonEducationInc.,2009

2. WalterA.TribelandAvtarSingh,The8088and8086Microprocessors,Programming,interfaci ng,Software, Hardware, and Applications, 4th Edition, Pearson Education Inc.,20033.MicroprocessorsandInterfacing, Programming and Hardware, 2nd Edition, Douglass V. Hall,TMH Edition,1999

3. SanjayK Bose, Hardware and Software of Personal Computers, New Age International (P)Ltd.,1991 MykePredko, Programming and Customizing the 8051 Microcontroller, TMH,1999

CS 2202	**DESIGN & ANALYSISOFALGORITHMS**

	Common with 6years integrated B.Tech(CSE)+M.Tech	
Instruction: 3Periods + 1 tutorial/week, Univ. Exam: 3 Hours		**Credits: 4**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course Objectives:

On completing this course student will be able to

1. Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound and writing programs for these solutions
2. Analyze the asymptotic performance of algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Synthesize efficient algorithms in common engineering design situations.

Course Outcomes:

1. Students will be able to justify the correctness of algorithms using inductive proofs and invariants
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe various paradigms of design use them appropriately when an algorithmic design situation calls for it.
4. Students will be able to Compare between different data structures. Pick an appropriate data structure for a design situation.

Syllabus:

1. **Introduction–** Fundamentals of algorithmic problem solving – important problemtype. Fundamentals of analysis of algorithms and efficiency – Analysis framework– Asymptotic Notations and Basic Efficiency classes – Mathematical Analysis ofNon- recursiveAlgorithms– MathematicalAnalysisofrecursiveAlgorithms–EmpiricalAnalysis of Algorithms – AlgorithmVisualization
2. **BruteForce**–SelectionSortandBubblesort–SequentialSearchandBrute–ForceString Matching – Closest Pair and Convex-Hull Problems by Brute Force – ExhaustiveSearch**Divide-and-Conquer**–Merge sort–Quick sort–BinarySearch– BinaryTreeTraversals and Related Properties – Multiplication of large integers and Strassen's Matrix Multiplication– Closest- Pair Convex-Hull Problems by Divide- and – Conquer
3. **Decrease – and – Conquer** – Insertion Sort – Depth-First Search and Breadth-FirstSearch-TopologicalSorting–AlgorithmsforGeneratingCombinatorialObjects–Decrease-by-a-Constant-Factor Algorithms – Variable-Size-DecreaseAlgorithms.
4. **Transform-and-Conquer** – Presorting – Gaussian Elimination – Balanced Search Trees– Heaps and Heap sort – Horner's Rule and Binary Exponentiation – ProblemReduction

   Space and Time Tradeoffs – Sorting by Counting – Input Enhancement in stringMatching – Hashing –B-Trees
5. **Dynamic Programming** – Computing a Binomial Coefficient – Warshall'sandFloyd's Algorithm – Optimal Binary Search Trees - The Knapsack Problem and MemoryFunctions

6. **Greedy Technique** – Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm– Huffman Trees **Limitations of Algorithm Power** – Lower-Bound Arguments –Decision Trees – P, NP and NP – complete problems – Challenges of NumericalAlgorithms

7. **Coping with the Limitations of Algorithms Power** – Backtracking – Branch-and-Bound– Approximation Algorithms for NP-hard Problems – Algorithms for solvingNonlinear Equations.

TextBook:

1. Introduction to Design & Analysis of Algorithms by Anany Levitin, Pearson Education, New Delhi, 2003
2. Fundamentals of Computer Algorithms, Horowitz and Sahni, Galgothiapublications.

ReferenceBooks:

1. Introduction to Algorithms by Thomas H. Corman, Charles E. Leiserson, Ronald R. Rivest&Clifford Stein, Prentice Hall of India, New Delhi, NewDelhi.

CS 2203	**DATABASE MANAGEMENT SYSTEMS** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3 Periods/week,	Univ. Exam: 3 Hours	**Credits: 3**

Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

Course Objectives:

1. To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
2. To understand conceptual and physical aspects of database design.
3. To learn formal and commercial query language specifications.
4. To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

1. The student will understand ER-modeling for conceptual database design and relational model.
2. The student is introduced to formal and commercial query languages : Relational Algebra, calculus and SQL.
3. The student will learn schema refinement and normalization.
4. The Student understands locking protocols concurrency control, and crash recovery methods.

Syllabus:

1. **Introduction**: File system versus a DBMS , Advantages of a DBMS, Describing and Storing Data ina DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

2. **Introduction to Database Design and The Relational Model**: Database Design and ER Diagrams,Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

3. **Relational Algebra and SQL**: Preliminaries, Relational Algebra, The form of a Basic SQL Query,UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

4. **Database Design**: Schema Refinement and Normal Forms, Introduction to Schema Refinement,Functional Dependencies, Reasoning about FD's, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

5. **Transaction Management**: The ACID Properties, Transactions & Schedules, ConcurrentExecution of Transactions, Lock-Based Concurrency Control.
6. **Concurrency Control**: 2PL, Serializability and Recoverability, Introduction to Lock Management,Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

7. **Crash Recovery**: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media

Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw- Hill

2. Database Management Systems; Raghu RamaKrishnan, Johannes Gehrke.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

CS2204	**FORMAL LANGUAGES & AUTOMATA THEORY** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits:3**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course objectives:

1. To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
2. To employ finite state machines to solve problems in computing.
3. To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
4. To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

1. Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
2. Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
3. Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

Syllabus:

1. Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages

2. Definition of finite state machine, Definite state machine, indefinite state machine, representations in mathematical diagram, tabular etc., id of finite state machine's, design of finite state machine from the given description, elimination of ϵ-transitions , indefinite state machine to definite state machine, optimization of finite state machine

3. Conversion of regular grammar to finite state machine, finite state machine to regular grammar, discussion of pumping lemma, systematic way of construction of finite state machine

4. Definition of regular expression, regular algebra, minimization of regular expressions, closure properties, construction of regular expression from the given description, regular expression to finite state machine, finite state machine to regular expression, construction of regular expression for the given finite state machine- a systematic way using Arden's theorem

5. Definition of push down machine, push down machine, types of push down machine's, push down machine to context free grammar, context free grammar to push down machine, design methodology of various push down machine's, push down machine by empty stack, push down machine by final states, conversion from one type to other type, applications of push down machine's

6. Parsing tree, bottom-up parsing, top-down parsing, types of context free grammar's, left-most and right most derivations, productions, reductions, optimization of context free

grammar's, elimination of e productions, unit productions, normal forms- cnf, gnf

7. Definition of Turing machine, ways of representing Turing machine's- tabular form, diagram, mathematical form, quintuples etc., design of Turing machine, id of Turing machine, types of Turing machine, halting problem, church's thesis, universal Turing machine, Gödel number, definitions of recursive functions- prf, rf, decidability. NOTE: Theorem proofs are eliminated

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition

2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books :

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

CS 2205	**MANAGERIAL ECONOMICS** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week,	Univ. Exam: 3 Hours	**Credits:3**

Internal: 30 Marks	University Exam: 70 Marks	Total: 100 Marks

Course Objectives:

- To bring about an awareness about the nature of Managerial Economics and its linkages with other disciplines.
- To understand the Micro and Macro Environment of Business.
- To familiarize the prospective engineers with the concepts and tools of Managerial Economics with an objective to understand the real world of business.

Course Outcomes:

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

- Understand the various economic activities in business and industry.
- Analyse the real world business problems.
- Make optimal business decisions for the effective and efficient management of Organisations.

SYLLABUS

Significance of Economics and Managerial Economics:
Economics: Definitions of Economics- Wealth, Welfare and Scarcity definitions Classification of Economics- Micro and Micro Economics.

Managerial Economics: Definition, Nature and Scope of Managerial Economics, Differences between Economics and Managerial Economics, Main areas of Managerial Economics, Managerial Economics with other disciplines.

Demand and Utility Analysis:
Demand - Definition, Meaning, Nature and types of demand, Demand function, Law of demand - Assumptions and limitations. Exceptional demand curve.

Elasticity of demand - Definition, Measurement of elasticity, Types of Elasticity (Price, Income, Cross and Advertisement), Practical importance of Price elasticity of demand, Role of income elasticity in business decisions, Factors governing Price Elasticity of demand.

Utility Analysis: Utility- Meaning, Types of Economic Utilities, Cardinal and Ordinal Utility, Total Utility, Marginal Utility, The law of Diminishing Marginal Utility and its Limitations**.**

Theory of Production and Cost analysis:
Production - Meaning, Production function and its assumptions, use of production function in decision making;

Cost analysis - Nature of cost, Classification of costs - Fixed vs. Variable costs, Marginal cost, Controllable vs. Non - Controllable costs, Opportunity cost, Incremental vs. Sunk costs, Explicit vs. Implicit costs, Replacement costs, Historical costs, Urgent vs. Postponable costs, Escapable vs. Unavoidable costs, Economies and Diseconomies of scale.

Market Structures : Definition of Market, Classification of markets; Salient features or conditions of different markets - Perfect Competition, Monopoly, Duopoly , Oligopoly, Importance of kinked demand curve ;Monopolistic Competition.

Pricing and Business Cycles:

Pricing Analysis : Pricing – Significance; Different Pricing methods- Cost plus pricing, Target pricing, Marginal cost pricing, Going -rate pricing, Average cost pricing, Peak load pricing , Pricing of joint Products, Pricing over the life cycle of a Product, Skimming pricing Penetration pricing, Mark- up and Mark- down pricing of retailers.

Business cycles - Definition, Characteristics, Phases, Causes and Consequences; Measures to solve problems arising from Business cycles.

Text Books:

1. Sankaran,S., **Managerial Economics,** Marghan Publications, 2015, Chennai.
2. Aryasri, A.R., **Managerial Economics and Financial Analysis,** MC Graw Hill Education, New Delhi,2015.

Reference Books:

1. Dwivedi, D.N., **Managerial Economics,** Vikhas Publishing House Pvt. Ltd. 6th Edition, New Delhi,2004.
2. Dewett, K.K., **Modern Economic Theory**, S.Chand & Company Ltd., New Delhi, 2005.

CS 2206	**ALGORITHMS LAB** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 1.5**
Internal: 50 Marks	**University Exam: 50 Marks**	**Total: 100 Marks**

Laboratory Outcomes:

The student should be able to:

• Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
• Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
• Analyze and compare the performance of algorithms using language features.
• Apply and implement learned algorithm design techniques and data structuresto solve real-world problems.

The laboratory component will emphasize two areas:

Implementation of algorithms covered in class: This will involve running the algorithms under varying input sets and measuring running times, use of different data structures for the same algorithm (wherever applicable) to see its effect on time and space, comparison of different algorithms for the same problem etc.

Design of Algorithms: This will involve design and implementation of algorithms for problems not covered in class but related to topics covered in class.

The exact set of algorithms to design and implement is to be decided by the instructor. In addition, there will be at least one significantly large design project involving some real world application. An efficient design of the project should require the use of multiple data structures and a combination of different algorithms/techniques.

Programs List:

1. a. Create a Java class called Student with the following details as variables within it.
(i) USN
(ii) Name
(iii) Programme
(iv) Phone
Write a Java program to create nStudent objects and print the USN, Name, Programme, and Phoneof these objects with suitable headings.
b. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2.a. Design a superclass called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a Java program to read and display at least 3 staff objects of all three categories.
b. Write a Java class called Customer to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as and display as using StringTokenizer class considering the delimiter character as "/".
3. a. Write a Java program to read two integers a andb. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero.
b. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number andprints; third thread will print the value of cube of the number.
4. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
6. Implement in Java, the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.

7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in Java.
8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal'salgorithm. Use Union-Find algorithms in your program
9. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
10. Write Java programs to

(a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm.

(b) Implement Travelling Sales Person problem using Dynamic programming.

11. Design and implement in Java to find a subset of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8} and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution. 12. Design and implement in Java to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

REFERENCES:

1. T. H. Cormen, C. L. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, MIT Press.
2. J. Kleinberg and E. Tardos, Algorithm Design, Addison-Wesley.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins.
4. A. Gibbons, Algorithmic Graph Theory, Cambridge University Press.
5. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, John Wiley.
6. R. Sedgewick, Algorithms in C (Parts 1-5), Addison Wesley.
7. M. H. Alsuwaiyel, Algorithm Design Techniques and Analysis, World Scientific.
8. Gilles Brassard and Paul Bratley, Algorithmics : theory and practice, Prentice-Hall.
9. Udi Manber, Introduction to Algorithms: A Creative Approach, Addison-Wesley.
10. Sara Baase and Allen Van Gelder, Computer Algorithms: Introduction to Design and Analysis, Addison-Wesley.

CS 2207	**DATABASE MANAGEMENT SYSTEMS LAB** *Common with 6years integrated B.Tech(CSE)+M.Tech*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits: 1.5**
Internal: 50 Marks	**University Exam: 50 Marks**	**Total: 100 Marks**

Course Objectives:

1. To introduce to a commercial DBMS such as ORACLE.
2. To learn and practice SQL commands for schema creation, data manipulation.
3. To learn conceptual and physical database design based on a case study.
4. To apply database design stages by studying a case study.

Course Outcomes:

1. The student is exposed to a commercial RDBMS environment such as ORACLE.
2. The student will learn SQL commands for data definition and manipulation.
3. The student understands conceptual through physical data base design.
4. The student takes up a case study and applies the design steps.

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL &Structured QueryLanguage(SQL)usedwiththeRDBMS.

I. Laboratory Exercises ShouldInclude:

a. Defining Schemas forApplications,
b. Creation ofDatabase,
c. Writing SQLQueries,
d. Retrieve Information fromDatabase,
e. CreatingViews
f. CreatingTriggers
g. Normalization up to Third NormalForm
h. Use of HostLanguages,
i. Interface with EmbeddedSQL,
j. Use ofForms
k. ReportWriting

II. Some sample applications are givenbelow:

1. Accounting Package for Shops,
2. Database Manager for Magazine Agency or NewspaperAgency,
3. Ticket Booking forPerformances,
4. Preparing Greeting Cards &BirthdayCards
5. Personal Accounts - Insurance, Loans, Mortgage Payments,Etc.,
6. Doctor's Diary &BillingSystem
7. Personal BankAccount
8. Class MarksManagement
9. HostelAccounting
10. Video TapeLibrary,
11. History of CricketScores,
12. Cable TV Transmission ProgramManager,
13. Personal Library.
14. SailorsDatabase
15. Suppliers and PartsDatabase

10. Computer Architecture and Organization, P.Chakraborty.

CS 2209	**PROFESSIONAL ETHICS AND UNIVERSAL HUMAN VALUES** *Common with 6years integrated B.Tech(CSE)+M.Tech and B.Tech(IT)*	
Instruction: 3Periods/week, Univ. Exam: 3 Hours		**Credits:3**
Internal: 30 Marks	**University Exam: 70 Marks**	**Total: 100 Marks**

Course Objectives:

The objective of the course is Six fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- This course will illuminate the students in the concepts of laws and its applicability to engineers
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection, Development of commitment and courage to act and also enable the students to imbibe and internalize the Values and Ethical Behaviour in the personal and professional lives
- To enable the students to imbibe the Values and Ethical Behavior in the personal and Professional lives
- The students will learn the rights and responsibilities Individual, employee, team member and a global citizen

Course Outcomes:

By the end of the course Student will be able to:

- Grasp the meaning of the concept – Law and also Get an overview of the laws relating to Engineers and also Apprehend the importance of being a law abiding person and They would have better critical ability
- Self-explore by using different techniques to live in harmony at various levels
- Analyze themselves and understand their position with respect to the moral and ethical character needed for a successful and satisfactory work life
- Students are expected to become more aware of themselves and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society

SYLLABUS

Need, Basic Guidelines, Content and Process for Value Education

•,Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the process for self-exploration, Continuous Happiness and Prosperity - A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility - the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking, Include practice sessions and case studies.

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as: a co-existence of the sentient 'I' and the material 'Body', the needs of Self ('I') and 'Body' - happiness and physical facility, the Body as an instrument of 'I' (I being the doer, seer and enjoyer), the characteristics and activities of 'I' and harmony in 'I', the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, P to ensure Sanyam and Health, Include practice sessions and case studies.

Understanding Harmony in the Family and Society - Harmony in Human – Human Relationship

- Understanding values in human-human relationship: meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, the meaning of Trust; Difference between intention and competence, the meaning of Respect, Difference between respect and differentiation; the

other salient values in relationship, the harmony in the society (society being an extension of family), Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family, Include practice sessions and case studies.

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all – pervasive space, Holistic perception of harmony at all levels of existence, Include practice sessions and case studies.

Concept of Law and Law of Torts

- Understanding Essentials of a Valid Contract and the basics of contract law protecting rights and obligations, Introduction to the Law of Torts and the basics to protect oneself and the company Law affecting the Workplace Employers Responsibilities/Duties Hiring Practices, Introduction to Intellectual Property Law, Professional Code of Conduct for Engineers, Relationship between Law and Ethics, Include practice sessions and case studies.

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations, Include practice sessions and case studies.

Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. R. Subramanian, "Professional Ethics", Oxford University Press.
4. S.B. Srivasthva, "Professional Ethics & Human Values", SciTech Publications (India) Pvt. Ltd. New Delhi.
5. D.R. Kiran, "Professional Ethics & Human Values", TATA Mc Graw Hill Education.
6. Saroj Kumar, "Business Law" and Avtar Singh, "Law of Contract"

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book), Mohandas Karamchand Gandhi "The Story of My Experiments with Truth", E. FSchumacher. "Small is Beautiful", Slow is Beautiful –Cecile Andrews, J C Kumarappa "Economy of Permanence", Pandit Sunderlal "Bharat Mein Angreji Raj" and Dharampal, "Rediscovering India
4. G K Kapoor, "Business Law" and Sen & Mitra, "Business & Commercial Laws" and Calvin Frank Allen, "Business law for Engineers"
5. Hilgard, E. R.; Atkinson, R. C. & Atkinson, R.L. (1975). *Introduction to Psychology*. 6th Edition. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.
6. Govindarajan, M; Natarajan, G. M. & Senthilkumar, V.S. (2013). *Professional Ethics & Human Values*. Prentice Hall: New Delhi
7. Gogate, S. B. (2011). Human Values & Professional Ethics. Vikas Publishing: New Delhi.
8. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, "Engineering Ethics, Concepts Cases: 4e, Cengage learning, 2015.

9. Caroline Whitbec, “ Ethics in Engineering Practice & Research: 2e, Cambridge University Press 2015.