

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



BCA / BCA (HONS) IN IOT AND BCA (HONS) IN AI AND
DEEP LEARNING

CURRICULUM STRUCTURE & SYLLABI
(2023-2027 BATCH ONWARDS)



**SCHOOL OF ENGINEERING AND TECHNOLOGY
MODY UNIVERSITY OF SCIENCE AND TECHNOLOGY
LAKSHMANGARH**

BACHELOR OF COMPUTER APPLICATIONS (BCA/ BCA – Honors)
Academic Curriculum (2023 – 24 onwards)

First Year
Curriculum Component

Component	Credit (BCA)	Credit (BCA- Hons) (IV Year)
1. University core (4 courses)	8	-
2. University Elective (2courses)	6	-
3. Basic Science (2 courses)	6	2 (1 Course)
4. Program Core (26 courses)	68	10 (4 Course)
5. Program Elective (4 courses)	12	10 (4 Specialization Electives)
6. Project/Seminar (2 courses)	17	10 (2 Course)
7. Proficiency (Non Credit/Non Graded)	-	3 (1 MOOC Course)
Total	117	35

Autumn Semester	Course Type	Course Title	Contact Hrs Per Week			Credits	ETE Duration Hours	Weightage %			
			L	T	P			CW	MTE	PBL	ETE
	UC 23.101	Human Values & Professional Ethics	2	0	0	2	3	10	40		50
	CA 23.101	Computer Fundamentals	3	-	-	3	3	10	40		50
	CA 23.103	C Programming	3	-	-	3	3	10	40		50
	CA 23.107	Foundation Course in Mathematics	3	1	-	4	3	10	40		50
	CY23.102	Environmental Studies	2	0	0	2	3	10	40		50
	FL	Foreign Language*(Non Grade)	3	-	-	3	3	25	25		50
	CA 23.133	Office Automation Laboratory	-	-	4	2	2	20	20	20	40
	CA 23.135	C Programming Laboratory	-	-	4	2	2	20	20	20	40
	SF 101	Personal Grooming and Fine Dining	0	0	2	1	2	50			50
		Sub Total	16	1	10	18					

Spring Semester	Course Type	Course Title	Contact Hrs per Week			Credits	ETE Duration Hour	Weightage %			
			L	T	P			CW*	MTE	PBL	ETE
	UC 23.102	Pragmatic English Communication	2	0	0	2	3	10	40		50
	UE	University Elective-I	3	-	-	3	3	10	40		50
	CA 23.102	Operating System	3	-	-	3	3	10	40		50
	CA 23.104	Data Structures	3	-	-	3	3	10	40		50
	CA 23.106	Systems Analysis and Design	3	-	-	3	3	10	40		50
	CA 23.108	Python Programming	3	1	-	4	3	10	40		50
	FL	Foreign Language*(Non Grade)	3	-	-	3	3	25	25		50
	CA 23.134	Data Structures Laboratory	-	-	4	2	2	20	20	20	40
	CA 23.136	Python Programming Laboratory	-	-	4	2	2	20	20	20	40
	SF 102	Social Grooming, Home & Decor and Business Communication	0	0	2	1	2	50			50
		Sub Total	20	1	10	22					

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Second Year
Curriculum Component

Autumn Semester	Course Type	Course Title	Contact Hrs per Week			Credits	ETE Duration Hours	Weightage %			
			L	T	P			CW	MTE	PBL	ETE
	UC 23.201	Introduction to Management and Leadership	2	0	0	2	3	10	40		50
	CA 23.201	Computer Organization	3	1	-	4	3	10	40		50
	CA 23.203	Database Management System	3	-	-	3	3	10	40		50
	PE	Program Elective-I	3	-	-	3	3	10	40		50
	CA 23.207	C++ Programming	3	-	-	3	3	10	40		50
	CA 23.209	Discrete Mathematics	3	1	-	4	3	10	40		50
	FL	Foreign Language*(Non Grade)	3	-	-	3	3	25			50
	CA 23.233	Database Management System Laboratory	-	-	4	2	4	20	20	20	40
	CA 23.235	C++ Programming Laboratory	-	-	4	2	4	20	20	20	40
	SF 201	Personal Grooming Fine Dining and Home Safety (Non Grade)	0	0	2	1	2	50			50
		Sub Total	17	2	8	23					

Spring Semester	Course Type	Course Title	Contact Hrs per Week			Credits	ETE Duration Hours	Weightage %			
			L	T	P			CW	MTE	PBL	ETE
	UC 23.202	Entrepreneurship Development	2	0	0	2	3	10	40		50
	UE	University Elective-2	3	-	-	3	3	10	40		50
	CA 23.204	Computer Networks	3	1	-	4	3	10	40		50
	CA 23.206	Computer Graphics	3	1	-	4	3	10	40		50
	CA 23.210	Java Programming	3	-	-	3	3	10	40		50
	PE	Program Elective-2	3	-	-	3	3	10	40		50
	FL	Foreign Language*(Non Grade)	3	-	-	3	3	25	25		50
	CA 23.234	Internet Laboratory	-	-	4	2	4	20	20	20	40
	CA 23.236	Java Programming Laboratory	-	-	4	2	4	20	20	20	40
	SF 202	Social Grooming and Professional Skills(Non Grade)	0	0	2	1	2	50			50
		Sub Total	17	2	8	23					

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Third Year
Curriculum Component

Autumn Semester	Course Type	Course Title	Contact Hrs per			Credits	ETE Duration Hours	Weightage %		
			L	T	P			CW	MTE	ETE
	CA 23.301	Web Technology	3	-	-	3	3	10	40	50
	CA 23.303	Software Engineering	3	0	0	3	3	10	40	50
	PE	Program Elective – 3	3	0	0	3	3	10	40	50
	CA 23.333	Web Application Development Laboratory	-	-	4	2	2	20	40	40
		Program Elective – 4				3		20	40	40
	FL	Foreign Language*(Non Grade)	3	-	-	3	3	25	25	
	CA 23.337	Minor Project	-	-	-	2	-	20	40	40
	SF 301	Civility and Ethics Business and Professional Grooming, Corporate Dinning	0	0	2	1	2	50	0	50
		Sub Total	12		4	16				

Spring Semester	Course Type	Course Title	Contact Hrs per Week			Credits	ETE Duration Hours	Weightage %		
			L	T	P			CW	MTE	ETE
	CA 23.312	Major Project*	-	-	-	15	-			100
		Sub Total				15				

Total Credits = 40+46+31=117

MTE : Mid Term Examination

ETE : End Term Examination

**Major Project: Spring Semester of third year will be exclusively for project training in an organization in which student shall be required to work on a project assigned by such organizations in consultation with the concerned Internal Supervisor allotted to her from the faculty members of the department. However, In exceptional conditions HOD may allow any student to undergo the project training in the campus under the supervision of faculty member assigned to her. At the end of the semester the student shall be required to submit a Project Report based on the project given to her. A committee of the Internal Supervisor & External Examiner will evaluate the report & conduct viva- voce.*

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Forth Year
Curriculum Component

Autumn Semester	Course Type	Course Title	Contact Hrs per Week			Credits	ETE Duration Hours	Weightage %			
			L	T	P			CW	MTE	PBL	ETE
		Specialization Elective-I	3	-	-	3	3	10	40		50
	CA 23.401	Network Security and Cryptography	3	-	-	3	3	10	40		50
		MOOC**	3	-	-	3	3	10	40		50
	CA 23.402	Research Methodology	2	-	-	2	3	10	40		50
	CA 23.403	Seminar	-	-	4	2		100			
		Specialization Elective Laboratory-I	-	-	4	2	4	20	20	20	40
	CA 23.405	Network Security and Cryptography Lab	-	-	4	2	4	20	20	20	40
		Sub Total	11	0	12	17					

Spring Semester	Course Type	Course Title	Contact Hrs per Week			Credits	ETE Duration Hours	Weightage %			
			L	T	P			CW	MTE	PBL	ETE
		Specialization Elective-II	3	-	-	3	3	10	40		50
	CA 23.411	Machine Learning	3	-	-	3	3	10	40		50
		Specialization Elective Laboratory-II	-	-	4	2	4	20	20	20	40
	CA 23.413	Machine Learning lab	-	-	4	2	4	20	20	20	40
	CA 23.412	Project/Dissertation				8					
		Sub Total	11	0	12	18					

Total Credits: 117+35= 152

*Choose any one which shall remain in all six semesters					
Semester- I			Semester-II		
FL 20.101	French Language & Grammar-I		FL 20.102	French Language & Grammar-II	
GL 20.101	German Language & Grammar-I		GL 20.102	German Language & Grammar-II	
JL 20.101	Japanese Language & Grammar-I		JL 20.102	Japanese Language & Grammar-II	
SL 20.101	Spanish Language & Grammar-I		SL 20.102	Spanish Language & Grammar-II	
Semester- III			Semester- IV		
FL 20.201	French Language & Grammar-III		FL 20.202	French Language & Grammar-IV	
GL 20.201	German Language & Grammar-III		GL 20.202	German Language & Grammar-IV	
JL 20.201	Japanese Language & Grammar-III		JL 20.202	Japanese Language & Grammar-IV	
SL 20.201	Spanish Language & Grammar-III		SL 20.202	Spanish Language & Grammar-IV	
Semester- V			**MOOC courses will be approved by Department.		
FL 20.301	French Language & Grammar-V				
GL 20.301	German Language & Grammar-V				
JL 20.301	Japanese Language & Grammar-V				
SL 20.301	Spanish Language & Grammar-V				

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Program Elective-1		
S. No.	Course Code	
1.	CA 23.231	Management Information System
2.	CA 23.232	Enterprise Resource Planning
3.	CA 23.237	Software Project Management
Program Elective-2		
S. No.	Course Code	Course Title
1.	CA 23.263	System Software
2.	CA 23.265	Internet Technologies
3.	CA 23.267	Network Security
4.	CA 23.208	Electronic Commerce
5.	ET 23.471	Cloud Computing (Infosys)
Program Elective 3		
1.	CA 23.373	Software and Case Study
2.	CA 23.375	Bioinformatics
3.	CA 23.377	Geographical Information System
4.	CA 23.369	E-Business
5.	ET 23.465	Agile Software Development (Infosys)
Program Elective 4		
1.	CA 23.362	Knowledge Management
2.	CA 23.364	Artificial Intelligence
3.	CA 23.366	Information Security
4.	CA 23.368	Cyber Laws
5.	ET 23.362	Mobile Apps Development (Infosys)

Choose any one which shall remain in 7th and 8th Semesters			
Specialization Elective-I: Internet of Things (IOT)		Specialization Elective Laboratory-I	
CA 23.481	Introduction to IOT	CA 23.484	Introduction to IoT Laboratory
CA 23.482	Wireless Sensor Networks & IoT Standards	CA 23.485	Sensors and Device laboratory
CA 23.483	IoT for Industries	CA 23.486	IoT for Industries Laboratory
Specialization Elective-II : AI and Deep Learning		Specialization Elective Laboratory-II	
CA 23.487	Artificial Neural Networks	CA 23.494	Artificial Neural Networks Lab
CA 23.488	Deep Learning	CA 23.495	Deep Learning Laboratory
CA 23.489	Natural language processing	CA 23.496	Natural Language Processing Lab

Credit Distribution across all Components									
Semester	UC	UE	BS	ES	PC	PE/SE	MOOC	Proj/Seminar	Total
First	2	-	6	-	10	-	-		18
Second	2	3	-	-	17				22
Third	2		-		18	3			23
Fourth	2	3			15	3			23
Fifth					8	6	-	2	16
Sixth								15	15
BCA	Total	8	6	6	68	12	-	17	117
BCA (Hons)	Seventh	-	-	2	-	5	5	3	17
	Eighth	-	-	-	-	5	5	-	18
	Total	-	-	2	-	10	10	3	35

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Exit Options:

- I. After II Semester - Exit option with Certificate in Computer Applications (with a minimum of 40 credits)
- II. After IV Semester - Exit option with Diploma in Computer Applications (with a minimum of 86 credits)
- III. After VI Semester - Exit Option with Bachelor of Computer Applications Degree, BCA Degree (with a minimum of 117 credits)
- iv. After VIII Semester - Award of Bachelor of Computer Applications- Honors Degree, BCA (Hons.) Degree (152 credits)

CA 23. 101

Computer Fundamentals

Total Lectures: 40
Credits : 3-0-0-3

Prerequisite(s): NIL

Objective(s): To understand the fundamentals of computers like basic working and structure of computer, data representation, and office automation and networking.

- 1 **Introduction to Computers:** Definition, Block Diagram, characteristics, Applications in Modern Society, History, Classification of computers and Generation of computers. [6]
- 2 **Functional Units of Computer Processing System:** Hardware, CPU, Memory and secondary storage devices, Input devices, Output Devices, Information Concept and Processing: Data, Information, Knowledge and Wisdom. [8]
- 3 **Data representation:** Representation of Data, Bits and Bytes, Number System: Decimal, Binary, Octal, Hexadecimal, Conversions b/w number system, Arithmetic Operations in Binary Number, ASCII, EBCDIC and BCD Codes. [8]
- 4 **Software Concepts:** Types of Software, Generation of Programming Language: Machine Language, Assembly Language, High Level Language, Translator: Assembler, Interpreter, Compiler, Operating System: Functions, types of operating system: Batch Processing, Multiprogramming, Multiprocessing, Multitasking, Time Sharing and Real Time System, MS-DOS, MS-Windows. [9]
- 5 **Data Communication and Computer Networks:** The Basic Communication System, Data Transmission Modes, Network types, Network Topologies, Internet and its Applications: E-mail, World Wide Web, Intranet, Extranet, Computer Threats: Virus, Worm, Trojan horse, Malware. [9]

Outcome(s): After completion of the course, students would be able to:

- Understand the concept of input/output devices of Computers and how it works.
- Learn the working of computer network and web communication.

Text Books: [1]. P.K.Sinha ,P.Sinha, Computer Fundamentals, 6th ed., BPB Publications, 2015.
[2]. R. Thareja, Fundamentals of Computers, 2nd ed., Oxford University Press India, 2016.

Reference Books: [1]. ITL Education Solutions Limited, Introduction to Computer Science, 2nd ed., Pearson Education, 2011.
[2]. V. Rajaraman, Fundamentals of Computers, 6th ed., PHI, 2015

CA 23.103

C- Programming

Total Lectures: 40
Credits :3-0-0-3

Prerequisite(s): NIL

Objective(s):

- To learn the basics of programming skills through C-Programming language.
- To understand the fundamentals concepts like syntax, and statements with essentials of efficient compiling, running and debugging processes.

- 1 **Introductory Concepts:** Introduction to computers, Computer characteristics, Types of programming languages, Introduction to C, identifiers and keywords, Data types: declaration and definition, Type conversion. [8]
- 2 **Operators:** Arithmetic, relational, logical, bitwise, unary, assignment, Increment and Decrement operators, conditional operators and their hierarchy, associativity, Data input/output. [6]
- 3 **Control Structure and Array:** Introduction, Conditional Statements; Simple If-Else; Nested Statements, switch, Loops- For, While, Do-While; Break, Continue, Go-To Statements, Labels, printf, scanf function. Defining an array, processing an array, passing arrays to functions, Multidimensional arrays, Arrays and strings. [13]
- 4 **Function and Pointer:** A brief overview, Defining a function, accessing a function, function prototypes, passing arguments to a function, recursion, Pointers: Declaration, operations on pointers, array of pointers, pointers to arrays. [7]
- 5 **Advance C Concepts:** Structure, Union, storage classes in C, Concept of files, file access in different modes, reading from and writing into a file, Library Functions. [6]

Outcome(s): At the end of the course student will be able to:

- Describe the process of problem solving through C.
- Write a justifiable C program for a given algorithm.
- Trace the certain C program manually.

Text Books:

- [1]. Y. Kanetkar, Let us C, 16th ed. BPB Publication, 2018.
- [2]. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2nd ed., Pearson Education, 2013.

Reference Books:

- [1]. H. Schildt, C: The Complete Reference, Fourth edition, McGraw- Hill Education, 2000.
- [2]. E. Balagurusamy, Programming in ANSI C, 4th ed., TMH Education, 2008.

CA 23. 107

Foundation course in Mathematics

Total Lectures: 40

Credits :3-1-0-4

Prerequisite(s): Nil

Objective(s):

- To acquire fundamental knowledge of (10+02) higher Mathematics and apply in science and engineering disciplines.

- Matrix:** Addition, Subtraction and Multiplication of matrices, column matrix, row matrix, unit matrix, diagonal matrix, zero matrixes. [6]
- Determinants:** Definition, Properties of Determinants, multiplication of Determinants, Value of Determinants up to third order, Minors and Co-factors. [8]
- Algebra:** Factorial Functions, Permutations and Combinations. [7]
- Calculus:** Differentiation, Integration of Standard functions, Definite Integrals. [11]
- Statistics:** Frequency Distribution, Mean, Median, Mode, and Standard Deviation and Variance. [8]

Outcome(s): After completion of the course, students would be able to apply fundamentals of (10+02) higher mathematical knowledge in science and engineering and also solve curriculum problems.

Text Books:

- [1].R.D. Sharma, 11th and 12th Mathematics, Dhanpatrai Publication, 2018.
- [2].Dass and Verma, Higher Engineering Mathematics, S.Chand, 2019.

Reference Books:

- [1].Majumder, Engineering Mathematics , Volume I, Central,1995.
- [2].Ramana B.V., Higher Engineering Mathematics, TMH, 2006.

CA 23. 104

Data Structures

**Total Lectures:40
Credits 3-0-0-3**

Prerequisite(s): CS-19.103 (C- Programming)

Objective(s):

- To provide knowledge of ways of structuring and operating on data, the nature of some fundamental problems, methods for addressing those problems,
- To promote an analytical and empirical appreciation of the behavior of algorithms using data structures

1. **Introduction:** Overview of data structure, types of data structures and operations. [4]
Applications of data structures.
2. **Pointer and dynamic memory allocation:** Pointer declaration and initialization, [9]
accessing a variable through its pointer, meaning and advantages of dynamic memory allocation, Memory allocation functions.
3. **Array, Sorting and Searching Techniques:** Representation of single and [9]
multidimensional array. Insertion Sort, Selection Sort, Merge Sort, quick sort, Linear Search, Binary Search.
4. **Stack & Queue:** Definition and representation of stack, operations on stack, Infix, [9]
Postfix, Prefix Expressions, Conversion from Infix to Postfix (Algorithms only).
Types of queues, Primitive Operations on Queues.
5. **Linked List & Tree:** Introduction to Linked List, implementation of Linked List, [9]
operations on linked list: creation, deletion, search and display, Tree introduction,
Traversal of Binary Trees.

Outcome(s): On the successful completion of the course, the student will be able to:

- be knowledgeable of certain abstract data types (ADT)
- be able to make a critical assessment of different implementations of an ADT
- be familiar with a number of fundamental computational problems, and be aware of real world instances of those problems

Text Books: [1].Lipschutz, Data Structures, Schaum's Outline Series, TMH, Revised ed. Feb. 2014.
[2].Horowitz and Sahani, Fundamentals of Data Structures, 2nd ed., University Press, 2008.

Reference Books: [1]. Langsam , Augenstein and Tannenbaum, Data Structure Using C and C++, 3rd ed., PHI, 1996.
[2].M. A. Weiss, Data Structures and Algorithm analysis in C++, 3rd ed., Addison Wesley,

CA 23. 106 System Analysis and Design

Total Lectures:40
Credits : 3-0-0-3

Prerequisite(s): NIL

Objective(s):

- To introduce the concept of system analysis for managing the projects
- To analyze and document systems, design new systems and implement their plans.

- 1 **Introduction to system:** Definition, characteristics and elements of system, types of system, System development life cycle, Role of system analyst. [6]
- 2 **System Planning and Initial Investigation:** Introduction, bases for planning in system analysis, initial investigation, fact finding, information gathering, information gathering tools, fact analysis, determination of feasibility. [7]
- 3 **Structured Analysis and Feasibility Study:** Tools of structured analysis: DFD, data dictionary, flow charts, Gantt charts, decision tree, decision table, structured English, pros and cons of each tool. Feasibility Study Objective, types, Steps in feasibility analysis, feasibility report, oral presentation, cost and benefit analysis, classification of costs and benefits. [10]
- 4 **Designing:** System Design Objective, logical and physical design, design methodologies, structured design, form-driven methodology (IPO charts), and structured walkthrough. [9]
Input/ Output and Form Design: Objectives of input and output design, form design, classifications of forms, requirements of form design.
- 5 **System Testing and Implementation:** Objectives of testing test plan, testing techniques/types of system tests, quality assurance goals in system life cycle, System implementation. [8]

Outcome(s): By learning the course, the students will be able to,

- Describe different approaches to systems analysis and design.
- Describe the five phases of the systems development life cycle (SDLC).
- Describe in detail the systems planning, systems analysis, systems design, systems implementation, and systems operation and support phases of the SDLC.

Text Books: [1].A wad Elias M, System Analysis and Design,,2nd ed., Galgotia Pub.(P) Ltd., 2008

Reference Books: [1].H. Igor, Introduction To System Analysis and Design, 5th ed., PHI, 2001
[2].M. Lejk and D. David , An Introduction to System Analysis Techniques, 1st ed., PHI, 1998

CA 23.108

Python Programming

Total Lectures: 40
Credit: 3-1-0-4

Prerequisite(s): C Programming (CA 19.103)

Objective(s): Python is a general-purpose, versatile and popular programming language. It's great as a first language because it is concise and easy to read, and it is also a good language to have in any programmer's stack as it can be used for everything from web development to software development and scientific applications.

1. **Basics of Python Programming:** History of python, installation of python , execution of python program, python character set, token, data type, inbuilt functions in python, operators and expressions, translating mathematical formulae into equivalent python expressions. [7]
2. **Python Program Flow Control :** Conditional blocks using if, else and elif, simple for loops in python For loop using ranges, use of while loops in python Loop, nested loops, break and continue [8]
3. **Functions:** syntax and basics of a function, parameters and arguments in a function, local and global scope of a variable, return statement, recursive function and lambda function [8]
4. **Strings and Lists:** Basic inbuilt python functions for string, immutable strings, strings operators and operations, creating and accessing the elements of the list, python inbuilt functions for lists. [9]
5. **Tuples, sets and dictionary:** creating tuples, inbuilt functions for tuples, operations on tuples, creating sets and set operations, creating dictionary, simple program on dictionary [8]

Outcome(s): Upon completion of this course students will be

- Familiar with Python syntax.
- Able to use python to implement a given logic.

- Text Books:**
1. John V Guttag, Introduction to Computation and Programming using Python, Prentice Hall of India, 2nd Edition, 2013.
 2. Swaroop C H. , A Byte of Python, URL: <https://python.swaroopch.com>

- Reference Books:**
1. Zed A. Shaw ,Learn Python the hard way: a very simple introduction to the terrifyingly beautiful world of computers and code, Third edition, 2014.
 2. Richard L. Halterman, Learning to Program with python, 2011.
 3. Allen Downey ,Think Python How to Think Like a Computer Scientist, Version 2.0.17, Green Tea Press Needham, Massachusetts, 2012.

CA 23. 201

Computer Organization

Total Lectures:40
Credits 3-1-0-4

Prerequisite(s): NIL

Objective(s):

- To understand the basics of combinational as well as sequential logic.
- To get familiar for analyzing the performance of digital circuits

- 1 **Boolean Algebra:** Laws and theorems of Boolean algebra. De-Morgan's theorem, [5]
XOR and XNOR gates, Half and Full Adder and Subtractor circuits.
- 2 **Fundamental Concepts:** Products, Sum of products and Product of sums, Form of [8]
Boolean expressions, Truth Tables and Karnaugh maps and Karnaugh simplification.
Multiplexers, decoders, characteristics of digital integrated digitals.
- 3 **Design of Simple Computer:** Micro Operation, Macro Operation, Bus and [8]
Memory Transfers, Arithmetic and Logic Micro Operations, Shift Micro Operation,
Instruction and Instruction Types
- 4 **Instruction Cycle:** Timing and Control Instruction Cycle, Memory Reference [8]
Instructions, Input Output and Interrupts, Machine Language Instructions
- 5 **I/O and Memory Organization:** Peripheral Devices, Input-Output Interface, [10]
Asynchronous Data Transfer, Modes of Transfer, Programmed I/O, Interrupt I/O
Direct Memory Access. Memory Hierarchy, Main Memory, Auxiliary Memory,
Associative, Cache Memory, Virtual Memory and Memory Management Hardware

Outcome(s): After successful completion of the course, student will be able to

- Develop a digital logic and apply it to solve real life problems.
- Analyze, design and implement combinational logic circuits.
- Classify different semiconductor memories.
- Analyze, design and implement sequential logic circuits.

Text Books:

[1].M. Mano, Digital Design, 4th ed., Prentice Hall of India, 2008
[2].R. P. Jain, Modern Digital Electronics, 3rd ed., TMH, 2003.
[3].W. Stallings, Computer Organization and Architecture, 9th ed., Pearson,2013

Reference Books:

[1].J. F.Wakerly, Digital Design, 4th ed, Pearson, 2008.
[2].C.H.Roth. Fundamentals of Logic Design, 6th ed., Thomson Learning, 2013.

CA 23.203

Database Management System

3-0-0-3

Total Lectures:40

Prerequisite(s): Nil

Objective(s): The objective of this Course is to:

- Understand the fundamental concepts of database management.
- Design and Normalize databases.
- Understand transaction processing control.
- Understand basic of object concepts and object relations.
- Understand the role of the DBMS & RDBMS in the organization.

1. **Introduction:** An Overview of Database Management System, Comparison of [10] Database System and File System, Characteristics of Database Approach, DBMS Architecture, Data Models, Schema and Instances, Data Independence. Data Modeling Using Entity Relationship Model: Entity, Entity Types, Entity Set, Notation for ER Diagram, Attributes and Keys, Concepts of Composite, Derived and Multivalued Attributes, Super Key, Candidate Key, Primary Key, Relationships, Relation Types, Weak Entities, Inheritance, Specialization and Generalization.
2. **Relational Data Model:** Relational Model Terminology: Domains, Attributes, [11] Tuples, Relations, Characteristics of Relations, Relational Constraints: Domain Constraints, Key Constraints, Relational Database Schema, Relational Database Design By ER To Relational Mapping. Introduction to SQL.
3. **Normalization:** Functional Dependencies, Armstrong's Inference Rule, Normal [4] Form up to Boyce Codd Normal Form.
4. **Relational Algebra:** Selection, Projection, Set Theoretic Operations Union, [8] Intersection, Set Difference And Division, Inner, Outer, Left Outer, Right Outer and Full Outer Join.
5. **Transaction Processing And Concurrency Control:** Definition of Transaction, [7] Desirable ACID Properties, Serializable And Non Serializable Transactions, Concurrency, Lost Update, Dirty Read, Concurrency Control Techniques: Locking, 2PL

Outcome(s): After completion of the course, students will be able to:

- Analyze database models & entity relationship models. Understand architecture for database development.
- Design E-R diagram
- Use Structured Query Language (SQL) with complex queries.
- Design and normalize the relations for any organization.

Text Books: [1] R. Elmasri & S. B. Navathe, Fundamentals of Database Management Systems, 7th ed., Pearson Education, 2016.
[2] R. Ramakrishnan, Database Management Systems, 3rd ed., Tata McGraw Hill, 2008.

Reference Books: [1] Korth and Schilberschatz, Database System Concepts, 6th ed., Tata McGraw Hill, 2011.
[2] C.J. Date, Database Systems, Tata McGraw Hill, 2nd Edition, 2003.

CA 23. 207

C++ Programming

Total Lectures: 40
Credits: 3-0-0-3

Prerequisite(s): CS-19.103 (C Programming)

Objective(s):

- To get a basic knowledge of object-oriented concepts.
- To master in programming related to classes inheritance using C++.

- 1 **Introduction to Object Oriented Programming and C++:** Basic concepts of object-oriented programming, Structured versus object-oriented programming, merits and demerits of object oriented methodology. C++ Preprocessor directives, Variables, data types, constants, operators, scope resolution operator, memory management operators, decision and loop control structures, arrays, strings, functions. **[8]**
- 2 **Classes and Objects:** Class definition, Structure versus class, accessing member functions within a class, data hiding, arrays within a class, static data and member functions, objects, friend functions and friend classes, constant member functions, pointers to members, constructors and destructor. **[9]**
- 3 **Overloading and Exception Handling:** Definition, unary operator overloading, binary operators overloading, overloading of new and delete operators, manipulation of string using operators, type conversion, overloading with friend functions, function overloading, error and exception handling. **[9]**
- 4 **Inheritance and Overriding:** Derived and base classes, type of inheritance, derived class constructors and destructor, overriding member functions, public and private inheritance, virtual base classes, abstract classes, this pointer, virtual functions and pure virtual functions, static and dynamic bindings. **[8]**
- 5 **Introduction of I/O Streams and the Standard Library:** Header files, I/O stream library, stream I/O for objects, file I/O. **[6]**

Outcome(s): On the successful completion of the course, the student will be able to:

- To gain the basic knowledge on object oriented concepts.
- To understand the role of inheritance, polymorphism, dynamic binding and generic structures in building reusable code.

Text Books: [3].R. Lafore, Object-Oriented Programming in C++, 4th ed., Pearson Education, 1997.
[4].Balagurusamy E., Object Oriented Programming With C++, 6th ed., Tata McGraw Hill Publishing Co. Ltd., 2013.

Reference Books: [1].Stroustrup Bjarne, Programming -Principles and Practice Using C++, 4th ed. Addison-Wesley, 2013
[2].Schildt Herbert, "C++: The Complete Reference", 4th ed., Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2003.

CA 23. 209

Discrete Mathematics

Total Lectures: 40
3-1-0-4

Prerequisite(s): Nil

Objective(s):

- To Introduce fundamental concepts and applications of discrete structure in the field of computer science

- Set Theory:** Definition of Sets, Subsets, Cardinality of Sets, types of sets: Equal Sets, Universal Sets, Finite and Infinite Sets, proper set, power sets, Operations on Sets: Union, Intersection, Complement of Sets, set difference, Cartesian Product, Venn Diagrams, and Algebra of sets, duality, counting principle. **[10]**
- Relations and Functions:** Definition, types of relation, Ordered Pairs, properties of relation, equivalence relations, partial ordering relation. Function: Domain and Range, Onto, Into, and One to One Function, Composite and Inverse Functions. **[8]**
- Algebraic Structures:** Definition of a group, properties of group, different types of group, subgroup, finite, infinitely, countable and Cyclic Groups. **[8]**
- Propositional Calculus:** Propositions, Logical Connectives: conjunction, disjunction and negation, Truth Tables, Tautologies and Contradictions, Conditional and Bi-conditional statements. **[8]**
- Counting:** Basic principles, permutations, combinations, summations, principle of inclusion and exclusion, pigeon-hole principle. **[6]**

Outcome(s): On the successful completion of the course, the student will be able to:

- Understand the theory and techniques of logic, graphs and trees, and algebraic systems.
- Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems.

Text Book: [1]. B. Kolman, C. Robert, S. Busb, C. Ross, Discrete Mathematical Structures, 6th ed., PHI, 2009.
[2]. H. R. Kenneth, Discrete Mathematics and Its Applications, 7th ed., TMH, 2011.

Reference Book: [1]. Swapan Kumar Chakraborty, BikashKanti Sarkar, Discrete Mathematics, Oxford Higher Education, 2011
[2]. C. L. Liu, D. P. Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, Tata Mcgraw-Hill, 3rd Edition, 2008.

UC 23.202

Business Environment

Total Lectures: 26
2-0-0-2

Objective: To familiarize the students about the background of the spectrum of business and its environment (internal and external).

Pre-requisite: Good General knowledge.

1. **Dimensions of Business Environment:** Nature and characteristics of contemporary business; Types of business environment - general and task environment, Internal (Value system, Organization structure, Human Resource, Company image and brand value, Physical assets) and external Environment (micro and macro), Environmental analysis and strategic Management. [5]
2. **Social Environment:** Concept and salient features of Indian culture and values, Impact of culture on business, Cultural resources, Ethics and social responsibility of business, Consumerism. [5]
3. **Political and legal Environment:** Impact of competing political ideologies and role of government, Political Stability and Instability on Business Activities, Legal framework for establishing a business unit in India, Competitive Conditions, Foreign Direct Investment in India. [5]
4. **Economic Environment:** Economic systems – Market, Planned and Mixed economy; Indian economy – overview; Economic reforms in India; Economic policies – Determinants of National Income, Privatization, Fiscal policy and Monetary policy. [6]
5. **Technological Environment:** Features of technology; Impact of technology; Management of technology; status of technology in India; Policy for research and development in India. [5]

Outcome: Understanding real life situations vis-à-vis economic, social, legal, political and technological systems in the country and analyzing the impact of changes on different industries and trends in different sectors of the economy and society.

Text Books:

1. Business Environment, Francis Cherunilam, 1st Edition, 2018.
2. Essentials of Business Environment, K Aswathappa, HPH, 12th Edition, 2014.

Reference Books:

1. Business Environment, BN Ghosh, OUP, 2015
2. Business Environment: Text & Cases (3rd Edition), Justin Paul, McGraw Hill, 2016.
3. Business Environment, AC Fernando, Pearson, 2016

CA 23. 204**Computer Networks****Total Lectures: 40**
Credits: 3-1-0-4**Prerequisite(s):** Nil

Objective(s):

- To become familiar with layered communication architectures (OSI and TCP/IP).
- To understand the client/server model and key application layer protocols.
- To understand fundamentals of computer networks and major routing protocols.

- 1 **Basic concepts of networks and Layered Architecture:** Computer networks [9]
introduction, network topologies, protocols and standards, Client-Server transactions,
Network devices: repeaters, bridges, gateway, Routers; categories of networks- LAN,
WAN and MAN. Layers and their function, OSI reference model, TCP/IP model,
Comparison of models.
- 2 **Physical layer:** Transmission Media, guided and unguided; Attenuation, Distortion, [7]
Noise, Switching.
- 3 **Data Link Layer:** Functionality, Framing, Encoding Techniques, Design Issue, Error [7]
Detection & Correction Codes, MAC.
- 4 **Network & Transport Layer:** Routing Algorithms (Distance Vector & Link State), [8]
IPv4 and IPv6, Connection Oriented and Connection Less services, Sliding Window
Protocols.
- 5 **Application Layer :** Network Security & Privacy, Data Compression & Cryptography, [9]
Electronic Mail (SMTP, POP3, IMAP), DNS, FTP, HTTP, telnet etc.

Outcome(s): On successful completion of this course, students will be able to

- Analyze computer network component and devices.
- Synthesize how communication works in a network and internet.
- Formulate the concept of topologies and their applications.
- Analyze protocol at different layers and how they play important role in network implementation.
- Enumerate the layers of OSI and TCP/IP models.

Text Book: [1]. B. A. Forouzan, Data Communications and Networking, 5th ed., Tata McGraw Hill, 2013.

Reference Book: [1]. A. S. Tanenbaum, Computer Networks, 4th ed., Prentice-Hall of India, 2002.

CA 23. 206

Computer Graphics

Total Lectures: 40
3-1-0-4

Prerequisite(s): CS-19.103 (C Programming)

Objective(s):

- To introduce the students with the graphics mode, with the help of basic algorithms and methodologies.
- The objective of the course is to equip students with fundamental knowledge and basic technical competence in the field of computer graphics.
- Provide an understanding of how a computer draws the fundamental graphics primitives.
- To learn Computer Graphics methodologies/Algorithms and techniques.

- 1 **Basic Concepts:** Application Areas of Computer Graphics, Graphical User Interface, [8]
RGB Color model, CMY color models, Advantages of Computer Graphics.
- 2 **Graphics Hardware:** Random Scan Displays, Raster Scan Display (with Introduction to [7]
Flickering, Interlacing, American Standard Video), Color CRT Monitors, Flat Panel
Display (Plasma Panel, Liquid Crystal Display, Electroluminescent Display).
- 3 **Raster Graphics Algorithms:** Line Drawing Algorithms-DDA, Bresenham's [12]
Algorithm, Circle and Ellipse Drawing Algorithms, Filling (Scan-Converting Polygon
Filling, Inside Outside Tests Boundary Fill and Area Fill Algorithm). Cohen- Sutherland
Algorithm of clipping.
- 4 **Transformations:** 2-D Transformations (Rotation, Reflection, Shearing, Scaling), [8]
Homogeneous Coordinate Representation, and Translation.
- 5 **Animation Introduction:** Conventional and Computer-Assisted Animation, Animation [5]
languages, methods of controlling Animation, basic rules of Animation.

Outcome(s): On successful completion of this course, students will be able to

- Understand basic concepts of computer graphics.
- Acquire knowledge about drawing basic shapes such as lines, circle ellipse, polygon.
- Perform processing of basic shapes by various processing algorithms /techniques.
- Implement two dimensional transformations.

Text Books:

[1].D. D. Hearn and M. P. Baker, Computer Graphics, 3rd ed., Prentice Hall India, 2011.
[2].A. Kalbag, Computer graphics & animation, 1st ed., Usborne, 1999.

Reference Books:

[1].J. D. Foley, A. V. Dam, S. K. Feiner, J. F. Hughes, Computer Graphics Principles and Practice, 2nd ed., Addison Wesley, 1995.
[2]. D. F. Rogers, Procedural Elements for Computer Graphics, 2nd ed., Tata McGraw Hill Publications, 2001.

CA 23. 210

Java Programming

Total Lectures: 40
3-1-0-4

Prerequisite(s): Nill

Objective(s): The objective of this course is to:

- Cover issues related to the definition, creation and usage of classes, objects and methods.
- Discuss the principles of inheritance and polymorphism.
- Provide the foundation of good programming skills by discussing key issues of the design of object- oriented software, including programming design and documentation.

- 1 **Basics of Java Programming:** Importance of Java, Java Byte code, Java and HTML, the Java buzzwords, using blocks of code, lexical issues, Java Class Libraries. Constants, Variables, Data Types, Operators, Type Conversion in Expression, Mathematical Functions, Decision Control Structure, Loop Control Structure, Arrays. **[10]**
- 2 **Class and Inheritance:** Class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, the this keyword, garbage collection, the finalize () method, overloading methods, using objects as parameters, returning objects, recursion, introducing access control, understanding static, introducing final, arrays revisited, introducing nested and inner classes, Wrapper Classes. Inheritance: Multilevel hierarchy, method overriding, Abstract classes, Final classes, String Class. **[10]**
- 3 **I/O and String Handling:** I/O basics, reading console input, writing console output, the PrintWriter class, reading and writing files, String and StringBuffer class, Various Types of string operations related to both the classes. **[6]**
- 4 **Package, Interfaces and Exception Handling:** Packages, importing packages, interfaces, exception-handling fundamentals, exception types, uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in exceptions, creating your own exception subclasses, using exceptions. **[7]**
- 5 **Applet Programming:** Applet life cycle, creating executable application, Designing a web page, Applet Tag, Parameter passing in applets, Graphic Class, lines, rectangles, circle and ellipse, polygons. **[7]**

Outcome(s): Upon completion of this course, students are able to:

- Understand the concepts of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- Develop programs using the in-built Java API and the Java standard class library.
- Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, automatic documentation through comments, error exception handling).

Text Book: [1]. H. Schildt, Java The Complete Reference, 8th ed., Herbert Schildt, 2011.
[2]. J. Jukowski, Mastering Java J2SE 1.4, SYBEX, 2002.

Reference Book: [1]. A. B. Downey, Think Java: How to Think Like a Computer Scientist, 2011.
[2]. P. Deitel, H. Deitel , Java How To Program, 10th ed., Deitel publication, 2014.

CA 23.301

Web Technology

Total Lectures: 40

Credit:3-0-0-3

Prerequisite(s): Nil

Objective(s):

- Build Web applications. Semantics and syntax of the HTML, Java Scripts and VB Scripts, including discussion on the practical problems that HTML solves. Write server-side scripts to implement dynamic Web pages that interact with databases and files.

1. **Introduction:** Clients, Servers, and Communication, The Internet Basic Internet Protocols, The World Wide Web, HTTP request message, response message, Web Clients Web Servers. [5]
2. **HTML:** HTML Document, Markup Tags (HTML, HEAD, TITLE, BODY, PRE, LIST, HR, BR), Formatting Tags (MARQUEE, BOLD, ITALICS, SUBSCRIPT), Linking, URL, Relative Path Vs Absolute Path names, Images, Tables, Frames, Form Elements (Text, Buttons, List, Reset, Submit, Radio buttons, Checkbox); DHTML: Cascading Style sheets, Dragging, Dropping, Layers, Div tag. [8]
3. **JavaScript:** Declaration and Expressions, Control Structure and Functions, Variable scope Global Vs Local, Object in Java Script: Properties and Methods, Array Object, Date Object, Math Object, String Object, Events in java Script: Onblur, Onclick, on change, on focus, Design of Interactive forms. [9]
4. **VBScript:** Fundamentals, Variables, String, Constant, Date and Time, Arrays, control Structure, Design making, looping, Sub procedure, Object Methods and events, data validation. [7]
5. **XML:** Overview, Comparison of XML and html, components of XML, XML document, XML declaration, Root element, An empty element, attributes, Markup Delimiters, Element Mark Up, Attribute Mark Up, Naming Rules, Character References, Predefined Entities, Entity References, Cdata Sections, Processing Instructions, Document Type Declaration, Wellformed and Valid Document, DTD and Validation, Internal DTD Subset, External DTD, Developing DTD, Elements and Attributes Of DTDs:- Empty Element, Only Element, Mixed Elements, Any Element, Creating a valid document from a DTD [11]

Outcome(s): After Successful completion of this course student will be able to:

- Write Java and VB scripts to handle HTML forms
- Write regular expressions including modifiers, operators, and meta-characters.
- Create HTML web pages that use various Scripting functions, and that manipulate files and directories

Text Books:

1. Young M .L, "Internet Millenium Edition" TMH, New Delhi, 2007.
2. Jackson Jeffrey C., "Web Technologies -A Computer Science Perspective", Pearson Education, 2006.

Reference Books:

- (1) Noel Jerkr, "Techunedia VB Scraper VB Script Interleave course", New Delhi 1998(2) Web Searching Technology and Search Engine Optimization[ISBN: 978 - 93 - 81786 - 92 - 5] by Bharat & Company
- (2) Marlin Webb, "Java Scraper, Instant JavaScript", Tata McGraw-Hill, New Delhi.(4) SEO Warrior: Essential Techniques for Increasing Web Visibility By John I Jerkovic, O'Reilly Media, November, 2009
- (3) Eathier Kay and Houser Alan, "XML programming in 2 ½ days," IDG Books India (P) Ltd.

CA 23. 303	Program Elective-1	Software Engineering	Total Lectures: 40 Credit:3-0-0-3
Prerequisite(s):	CA 19.103 (C Programming)		
Objective(s):	- To know about software requirements specification, requirement elicitation, structured system analysis and introduction of object-oriented analysis and design, design techniques. - To acquire knowledge on implementation issues such as modularity and coding standards		
	Introduction: Software Characteristics, Components and Applications, Software Engineering a layered Technology, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models. [8] Software Project Management: Basic Concepts, Project Management: Core functions, support functions, Project Integration Management. [8] Software Project Planning: Objectives, decomposition techniques: software sizing, problem based estimation, lines of code based estimation, and function point based estimation, process based estimation, Cost Estimation Models:-COCOMO, Risk Management. [8] Software Design: Design Principles, Design Concepts:- abstraction, refinement, modularity, software architecture, structured partitioning, information hiding, effective Modular Design:- functional independence, cohesion and coupling, Object Oriented analysis and Design. [8] Software Testing: Testing Fundamentals, Design of Test Cases, White box testing, Basis Path testing, Control structure Testing, Black box testing. [8]		
Outcome(s):	- Demonstrate knowledge of the distinction between critical and non-critical systems and ability to manage a project including planning, scheduling and risk assessment/management. - Author a software requirements document and understanding of the proper contents of a software requirements document.		
Text Books:	- Pressman R.S., "Software Engineering", Tata McGraw Hill Publishing Company Ltd., 8th edition, 2014 - Jalote Pankaj, "An Integrated Approach to Software Engineering", NAROSA. 3rd edition, 2005.		
Reference Books:	Rajib Mall, Fundamentals of Software Engineering, Prentice-Hall, 2nd edition, 2004.		

S. No. Course Code

- | | | |
|----|-----------|-------------------------------|
| 1. | CA 23.231 | Management Information System |
| 2. | CA 23.232 | Enterprise Resource Planning |
| 3. | CA 23.237 | Software Project Management |

Program Elective-2

S. No. CourseCode

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|----|-----------|---------------------------|
| 1. | CA 23.263 | SystemSoftware |
| 2. | CA 23.265 | InternetTechnologies |
| 3. | CA 23.267 | NetworkSecurity |
| 4. | CA 23.208 | Electronic Commerce |
| 5. | ET 23.471 | Cloud Computing (Infosys) |

CourseTitle

Program Elective3

- | | | |
|----|-----------|--------------------------------------|
| 1. | CA 23.373 | Softwareand CASE Tools |
| 2. | CA 23.375 | Bioinformatics |
| 3. | CA 23.377 | Geographical Information System |
| 4. | CA 23.369 | E-Business |
| 5. | ET 23.465 | Agile Software Development (Infosys) |

Program Elective4

- | | | |
|----|-----------|-----------------------------------|
| 1. | CA 23.362 | Knowledge Management |
| 2. | CA 23.364 | Artificial Intelligence |
| 3. | CA 23.366 | Information Security |
| 4. | CA 23.368 | CyberLaws |
| 5. | ET 23.362 | Mobile Apps Development (Infosys) |

CA 23. 231

Management Information System

**Total Lectures: 40
3-0-0-3**

Prerequisite(s): Computer Fundamental

Objective(s): To understand how to leverage information systems to effectively operate and grow an enterprise. The course provides a foundation in the theory and practical application of information systems within an organization. Managing, analyzing, designing, and implementing an MIS will be the focus of the course

- 1 **Introduction:** Elements, characteristics, objectives and importance, relationship between MIS and Computer, role of MIS in the functions of management. [6]
- 2 **Information:** Classification of information, levels of information, techniques of data collection, quality aspect of information, value of Information [8]
- 3 **Decision Making:** Decision making concepts, rationality in decision making, decision support system, MIS as a technique for programmed decisions, structured v/s Un-structured decisions, formal vs. informal systems, model of decision making, methods, MIS and role of decision making. [8]
- 4 **Manager and Computers:** Database concept, database models, database design, RDBMS, MIS and RDBMS, network topology, LAN, MAN, WAN and data communication. [9]
- 5 **Development and Application of MIS:** Strategic and project planning for MIS, conceptual system design, detailed design, implementation, evaluation and maintenance of the MIS, pitfalls of MIS. MIS for marketing, financial, production management, human resource management. [9]

Outcome(s): After completion of the course, students would be able to:

- understand and articulate fundamental concepts of information technology management.
- assess and apply IT to solve common business problems.
- suggest and defend effective solutions to business problems, and design a database application to solve a business problem.
- discuss the ethical aspects of information technology use in the organization and its governance issues.

Text Books: [1]. Jawadekar, W. S. "Management Information System", Tata McGraw- Hill Publishing Co. Ltd., New Delhi, 2004

Reference Books: [1]. Murdick, R, G, Ross J E and Clagget, J, R, "Information Systems for Modern Management", PHI, New Delhi, 2003
[2]. Sadagopan, "Management Information System", PHI, New Delhi, 2010.
[3]. Parker, Case Thomas, "Management Information System: Strategies and Action", Tata McGraw- Hill Publishing Co. Ltd., New Delhi

CA 23.232

Enterprise Resource Planning

Total Lectures: 40
3-0-0-3

Prerequisite(s): Computer Fundamental and Networking

Objective(s): This course will enable student understanding of issues and decisions that must be made when embarking upon a ERP selection and implementation journey. It will also lead to an understanding the challenges associated with managing extant ERP systems.

- 1 **Overview:** Definition, ERP & Business, Evolution of ERP, Need of ERP, Features of ERP, Motivation behind ERP, Technologies & Infrastructure required for ERP, Demerits of ERP, benefits & application, BPR & ERP, ERP Market. **[6]**
- 2 **Data Mining & Data Warehousing:** Foundation of Data Mining, scope of Data Mining, Mechanism, Data Mining methods & Algorithms, Relevance of Data Mining to BPR, Database marketing by Data mining. Data warehouse Management System, Business Intelligent system architecture, features, Application, Necessity of Data warehousing, critical factors for the failure of Data warehouse. **[8]**
- 3 **Implementation Issues:** Implementation Methodologies, Post Implementation Issue, Hidden Costs of ERP (Training, Testing, Dirty Data), Role of consultant **[8]**
- 4 **ERP Module :** BAAN, SAP, ORACLE, People soft, Comparison of major ERP packages **[9]**
- 5 **ERP & E-commerce:** Electronic Data Interchange, Advantage of EDI with respect to business, ERP fitness with E-commerce, Post ERP work with E-commerce, ERP & Internet. **[9]**

Outcome(s): After completion of the course, students would be able to:

- Understand and gain insight into process views of organizations and tools and techniques used to model both as-is and to-be models.
- Apply the process modeling techniques in one or more modeling environments.
- Know and be able to apply key technical terminology in enterprise information systems as they apply in different ERP products and development methods
- Understand key differences between the major ERP applications (such as SAP R/3, and Oracle/PeopleSoft/Sibel) and issues specific to these applications their configuration and management.
- Analyze a current architecture and perform an effective gap analysis before an ERP implementation
- Be able to map enterprise architectural resources to a contemporary Enterprise Architecture mapping tool.

Text Books:

- [1]. Luvai F. Motiwalla, Jeff Thompson, Enterprise Systems For Management, Pearson Education., 2nd Ed., 2011
- [2]. Ravi Shankar, S. Jaiswal, Enterprise Resource Planning, Galgotia Publication Pvt. Ltd., 2nd Ed., 2005.

Reference Books:

- [1]. Monk, E. F., Wagner, B. J., Concepts in Enterprise Resource Planning, Course Technology Cengage Learning, 3rd Ed. 2009.
- [2]. Chuck Munson, Supply Chain Management Casebook : The Comprehensive Coverage and Best Practices in SCM, Pearson FT Press 2013.
- [3]. Ferran, C., and Salim, R., Enterprise Resource Planning for Global Economics: Managerial Issues and Challenges, Information Science References, 2008.

CA 23.237

Software Project Management

Total Lectures: 40

Credit: 3-0-0-3

Prerequisite(s): (System Analysis and Design)

Objective(s):

- To introduce the concepts of Software Project Management to the students.
- To make the students understand the requirement for project evaluation.
- To make the students understand the requirement for Software quality assurance and project management along with its tools.

- 1 **Introduction to Software Project Management (SPM)** : Software Engineering problem and software product, software product attributes, definition of a Software Project (SP), SP vs. other types of projects activities covered by SPM, categorizing SPs, Project Management cycle, SPM framework, types of project plan [10]
- 2 **Project Evaluation:** Strategic assessment, technical assessment, cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation [8]
- 3 **Activity Planning:** Objectives, project schedule, sequencing and scheduling activities, network planning models, forward pass, backward pass, activity float, shortening project duration, activity on arrow networks. [8]
- 4 **Managing people and Organizing teams:** Introduction, understanding behaviour, organizational behavior, working in groups, becoming a team, decision making leadership, organizational structures. [7]
- 5 **Software Quality Assurance and Testing:** Testing principles and objectives, test plan, types and levels of testing, test strategies, program verification and validation, software quality, SEI-CMM, SQA activities, QA organization structure, SQA plan [7]

Outcome(s): After completion of the course, students would be able to:

- Identifying the essential skills required to be an excellent project manager
- Analyzing the main factors influencing project management outcome

Text Books:

[1]. Bob Hughes, Mikecotterell, "Software Project Management", Fourth Edition, Tata McGraw Hill, 2009.

[2]. Ashfaque Ahmed, "Software Project Management: A Process-Driven Approach", CRC Press, 2016.

Reference Books:

[1]. Ramesh, Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2nd ed. 2005.

[2]. Royce, "Software Project Management", Pearson Education, 1999

[3]. Walker Royce Software Project Management,, Addison Wesley, 1998.

CA 23. 263

System Software

**Total Lectures: 40
3-0-0-3**

Prerequisite(s): Basic concepts of Unix-like systems. Shells and scripting. System-level programming in the C language. Software development tools and techniques.

Objective(s): This course provides an introduction to computer systems and explores the design and implementation issues of System programs that play an important role in program development.

- 1 **Overview:** Language processors, data structures for language processors, [6]
assemblers, macros and macroprocessors, compilers, interpreters, linkers and loaders.
- 2 **Operating System:** Functions of Operating System, Kernel, Shell, Process, Process state [8]
diagram, System Calls
- 3 **Assemblers:** Design of an assembler, one pass and two pass Assembler, Databases of [8]
Assemblers, table processing
- 4 **MacroProcessors:** Importance of Macro, Macro Definition, Macro call, Macro [9]
Expansion, Conditional Macro expansion, Nesting of Macros, Functions of Macro Processor.
- 5 **Loaders, Linkers and Compilers:** Functions of Loaders, loader schemes-compile and go, [9]
general, absolute, subroutine linkages, relocating loaders, direct linking loaders, binders,
linking loaders, overlays, dynamic binders, Types of Compilers, Phases of
compiler design, recursion, call and return statements.

Outcome(s): After completion of the course, students would be able to:

- Apply knowledge of mathematics, science, and engineering
- Design a system, component, or process to meet desired needs within realistic constraints.
- Identify, formulate, and solve engineering problems Understand the concept of input/output devices of Computers and how it works.

Text Books: [1]. Donovan J.J., "Systems Programming", New York, Mc-Graw Hill, 3rd Ed 1993.

Reference Books: [1]. Leland L Beck, "System Software, An Introduction to System Programming",
Pearson Education, 13th Indian Reprint, New Delhi, 2003
[2]. Dhamdhere, D.M., "Introduction to Systems Software", Tata Mc-Graw Hill 1996.

CA 23. 265

Internet Technologies

Total Lectures: 40
Credits 3-0-0-3

Prerequisite(s): Computer Fundamental

Objective(s): Internet Technologies presents the student with an introduction to the Internet and its services, applications and tools

- 1 **Introduction:** Layering, TCP/IP Layering, Internet Addresses, The Domain Name System, Client Server Model, Port Numbers, Implementations and Application, Programming interfaces. [6]
- 2 **IP:** The Link Layer Ethernet and IEEE 802 Encapsulation Trailer Encapsulation, **SLIP:** Serial Line Interface Protocol, Compressed **SLIP**, **PPP:** Point-to-Point Protocol. The Internet Protocol IP Header, IP Routing, Subnet Addressing, Subnet Mask, Special Case IP Addresses. [8]
- 3 **Introduction to ARP:** Address Resolution Protocol and RARP: Reverse Address Resolution Protocol, ARP Packet Format, Proxy ARP, RARP Packet Format. [8]
- 4 **ICMP:** Internet Control Message Protocol Introduction, ICMP, Message Types, ICMP Address, Mask Request and Reply, IP Routing Routing Principles, Introduction to Dynamic Routing; . **UDP:** User Datagram Protocol UDP Header, UDP Checksum; **DNS:** The Domain Name System DNS Basics, DNS Message Format, security [9]
- 5 **TCP:** Transmission Control Protocol TCP Services, TCP Header TCP Connection, Establishment and Termination, TCP Timeout and Retransmission, Repacketization; Telnet and Rlogin Remote Login Rlogin Protocol, SMTP Protocol; **FTP:** File Transfer Protocol and SMTP: Simple Mail Transfer Protocol. [9]

Outcome(s): After completion of the course, students would be able to:

- Understand different types of networks, various topologies and application of networks.
- Understand types of addresses, data communication.
- Understand the concept of networking models, protocols, functionality of each layer.
- Learn basic networking hardware and tools.

Text Books: [1]. Tannenbaum A. S., "Computer Networks", Prentice-Hall India., New Delhi
[2]. Forouzan Behrouz A, "Data Communication and Networking", TMH, New Delhi

Reference Books: [1]. Sybex, "Networking Complete", BPB Publication, New Delhi
[2]. Stallings William, "Data and Computer Communication", Pearson Education, New Delhi

CA 23.267

Network Security

Total Lectures: 40
Credits 3-0-0-3

Prerequisite(s): Computer Fundamental and Networking,
Basic Mathematics.

Objective(s): Students will learn the basic concepts in computer security including software vulnerability analysis and defense, networking and wireless security, applied cryptography, as well as ethical, legal, social and economic facets of security.

- 1 **Introduction:** Attacks, Services and Mechanisms, Security Attacks, Security Services, Integrity check, digital Signature, authentication, has algorithms [6]
- 2 **Secret Key Cryptography:** Block Encryption, DES rounds, S-Boxes IDEA: Overview comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB CBC, OFB, CFB, Multiple encryptions DES, Hash Functions and Message Digests: Length of hash, uses, algorithms (MD2, MD4, MD5, SHS) MD2: Algorithm (Padding, checksum, passes.) MD4 and 5: algorithm (padding, stages,digest computation.) SHS: Overview, padding, stages [8]
- 3 **Public key Cryptography:** Algorithms, examples, Modular arithmetic (addition,multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption.Other Algorithms: PKCS, Diffie-Hellman, El-Gamal signatures, DSS, Zero-knowledge signatures [8]
- 4 **Authentication:** Password Based, Address Based, Cryptographic Authentication. Passwords in distributed systems, on-line vs offline guessing, storing. Cryptographic Authentication:passwords as keys, protocols, KDC's Certification Revocation, Interdomain, groups, delegation. Authentication of People: Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics, Kerberos: purpose, authentication, serer and ticket granting server, keys and tickets, use of AS and TGS, replicated servers. Kerberos V4: names, inter-realm authentication,Key version numbers. Kerberos V5: names, realms, delegation, forwarding and proxies, ticket lifetimes, revoking tickets, multiple Realms [9]
- 5 **Network Security:** Electronic mail security, IP security, Network management security.Security for electronic commerce: SSL, SET. System Security: Intruders and Viruses, Firewalls, Intrusion Detection [9]

Outcome(s): After completion of the course, students would be able to:

- Identify the security goals of an information system, point out contradictory goals and suggest compromises.
- Understand of the principles underlying cryptography and cryptanalysis and have a technical understanding of the main cryptographic concepts and technologies.
- Understand the purpose of security protocols and be witness to the difficulties of their verification.

Text Books: [1].AtulKahate,“ Cryptography and Network Security”, TMH, New Delhi
[2].Kaufman, C., Perlman, R., and Speciner, M., “Network Security, Private Communication in a public world” , PHI

Reference Books: [1].Stallings, W., “Cryptography and Network Security: Principles and Practice”, Prentice Hall.
[2].BehrouzAForouzan, “Cryptography and Network Security”; McGraw Hill.

CA 23. 208

Electronic Commerce

**Total Lectures: 40
3-0-0-3**

Prerequisite(s): Computer Fundamental

Objective(s): A comprehensive overview of how firms compete in today's environment with a focus on strategic choices and the infrastructures affecting e-commerce including technology, capital, media, and public policy.

- 1 **Electronic Commerce:** Overview and Scope, Traditional Commerce vs. Electronic Commerce, Impact of E-Commerce, Electronic Markets, Internet Commerce, e-commerce in perspective, Application of E Commerce in Direct Marketing and Selling, advantages and disadvantages, and future of E-commerce [6]
- 2 **Business strategy in an Electronic Age:** Value Chains, Supply chain, Porter's value chain Model, Inter Organizational value chains, Strategic Business unit chains and industry value chains. [8]
- 3 **Business to Business E-Commerce:** Inter-organizational Transitions, Credit Transaction Trade Cycle, a variety of transactions. Electronic Data Interchange (EDI): Introduction, Benefits of EDI, EDI Technology, EDI standards, EDI Communication, EDI Implementation, EDI agreement, EDI security. [8]
- 4 **Electronic Payment System:** Introduction, Online Payment System, Prepaid Electronic Payment System, Post Paid Electronic System, E-Cheques, Credit Cards, Smart Cards, E-Purses, Debit Cards, Legal Risk of E-Payment System. [9]
- 5 **Securing Network Transaction:** Security Policy, Procedures and Practices, Transaction Security, Cryptography Algorithm, Public Key Algorithm, Authentication Protocol, Digital Signature, E-Mail Security. Different case studies of E-commerce [9]

Outcome(s): After completion of the course, students would be able to:

- Illustrate management's role in the networked economy.
- Identify strategies involved in running an e-commerce company.
- Identify factors of successful implementation of an online strategy.
- Compare metrics used to evaluate progress of an e-commerce strategy.
- Summarize the effect of laws and regulations on e-commerce and Internet business.

Text Books: [1]. Whitely David, "E-commerce Strategy, Technology and application", Tata McGraw Hill Publications, New Delhi, 2005.

Reference Books: [1]. Kalakota, R. and Whinston, A. B. "Readings in Electronic Commerce", Addison Wesley, 2006
[2]. Schneider, Gary P. and Perry, Jame, "Electronic Commerce" Thomson Publication, 2003
[3]. P.T. Joseph, S.J., "E-Commerce : An Indian Perspective", PHI.

ET 23.471

Cloud Computing (Infosys)

Total Lectures: 40
3-0-0-3

Prerequisite(s): Computer Fundamental and Networking
Object Oriented Design and Programming

Objective(s): This course covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, Software as a Service, and Physical Systems as a Service.

- 1 **Overview of Cloud Computing:** Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing. Why Cloud Computing, Cloud service models (IaaS, PaaS&SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing. Introduction to AWS Public Cloud Vendor. Cost optimization in AWS. [6]
- 2 **Virtualization:** Basics of virtualization, Virtualization technologies, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing. Introduction to EC2 service of AWS. [8]
- 3 **WWoWorking with Private Cloud:** Private Cloud Definition, Characteristics of rivate Cloud, Private Cloud deployment models, Private Cloud Vendors - CloudStack, OpenStack, Eucalyptus Microsoft, Private Cloud – Benefits and Challenges. Private Cloud implementation in Amazon EC2 service. [8]
- 4 **Working with Public Clouds:** What is Public Cloud, Why Public Cloud, When to opt for Public Cloud, Public Cloud Service Models, and Public Cloud Players. Infrastructure as a Service Offerings, IaaS Vendors, PaaS offerings, PaaS vendors, Software as a Service. Demonstrating public cloud with AWS – Storage and Database services. Private vs. Public Cloud – When to choose. [9]
- 5 **Overview of Cloud Security:** Explain the security concerns in Traditional IT, Introduce challenges in Cloud Computing in terms of Application Security, Server Security, and Network Security. Security reference model, Abuse and Nefarious Use of Cloud Computing, Insecure Interfaces and APIs, Malicious Insiders, Shared Technology Issues, Data Loss or Leakage, Account or Service Hijacking, Unknown Risk Profile, Shared security model between vendor and customer in IAAS/PAAS/SAAS, Implementing security in AWS. Migration paths for cloud, Selection criteria for cloud deployment, Issues/risks in cloud computing, Future technology trends in Cloud Computing. [9]

Outcome(s): After completion of the course, students would be able to:

- Understand the concepts of cloud computing
- Understand the advantages and limitations of different cloud architectures.
- Understand the enabling technologies for building cloud systems.
- Understand the concept of security in cloud computing.

Text Books: [1].Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, AndrezeiM. Goscinski, 2011
[2].Cloud Computing, By Michael Miller, 2008.
[3].Cloud Computing for dummies, By Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, 2009.

Reference Books: [1].Rittinghouse, John, W. Cloud computing: Implementation, management and security
[2].Rhoton, John, Cloud Computing Architected: Solution Design Handbook.
[3].Krutz, Ronald L.; Vines, Russell DeanKalakota ,R. and Whinston, A. B.,“Cloud Security: A comprehensive Guide to Secure Cloud Computing”, Addison Wesley.

CA 23. 373

Software and CASE Tools

total Lectures: 40
3-0-0-3

Prerequisite(s):

Computer Fundamental, Computer programming

Objective(s):

- To introduce the concept of software crisis, managing complexity, requirements specification, architectural and detailed design, testing and analysis, software process, and tools and environments.
- Explores concepts and techniques for design and construction of reliable and maintainable software systems in modern high-level languages; program structure and design; program-correctness approaches, including testing; and event-driven programming

- 1 **Software Engineering Fundamentals** : Definition of software product and process, Software Characteristics, Components, Applications, Layered Technologies, Processes and Product, Methods and Tools, Generic View of Software Engineering, Software Crisis and Software development paradigms [6]
- 2 **Software Requirements Analysis & Specification:** System specification, Software requirements specification (SRS) standards, Analysis Modeling: Difference between Data and Information, ER Diagram, Dataflow Model, Control Flow Model, Control and Process Specification, Data Dictionary [8]
- 3 **Software Design:** Software architecture, Modular design - cohesion and coupling, Process-oriented design, Data-oriented design, User-interface design, Real-time software design, introduction to Object Oriented Design [8]
- 4 **CASE Tools, Coding and Testing:** Computer-aided software engineering, Introduction to CASE, Building Blocks of CASE, Integrated Case Environment, Characteristics of good Programming languages, Introduction to Testing Process, Testing Activities like Unit, Integration & System Testing. [9]
- 5 **Reengineering, Quality and Metrics:** Business Process Reengineering, Reverse Engineering, Software re-engineering. SQA-Software Quality Assurance, Software Reliability, Software quality metrics, SQA plan, ISO 9000 and 9001 Quality Standards. [9]

Outcome(s):

After completion of the course, students would be able to:

- Make independent and critical assessments,
- Identify, formulate and solve problems autonomously, and
- Deal with changes in working life.
- Stay abreast of the development of knowledge, and
- Communicate their knowledge to others, including those who lack specialist knowledge in the field.

Text Books:

- [1]. Pressman R.S. , “Software Engineering”, TMH 7th Ed 2014.
[2]. Pankaj Jalote, “An Integrated Approach to Software Engineering”, NAROSA, 2005.

Reference Books:

- [1]. Designing Flexible Object Oriented systems with UML - Charles Ritcher
[2]. Fairly, R.E., “Software Engineering Concepts”, McGraw-Hill
[3]. Object-Oriented Analysis and Design: using UML Mike O'Docherty Wiley Publication

CA 23. 375

Bioinformatics

Total Lectures: 40
3-0-0-3

Prerequisite(s): Computer Networking

Some knowledge of genetics or molecular biology would be advantageous.

Objective(s): To deliver descriptions of this rapidly evolving field, and facilitate user access to and manipulation of the biological data. This will include descriptions of genetic and biological databases and relevant tools available to retrieve and analyse the information within these.

- 1 **Biological Information Resources:** Introduction to biological data and database management, Biological databases – Protein databanks (Primary and Secondary databank; Sequence and structuredatabank), Genomicdatabanks (Sequence and specialized databanks). [6]
- 2 **Sequence Alignment:** Introduction to biological sequence alignment, Database searching, Algorithm for sequence alignment, Pairwise alignment (Needleman and Wunsch algorithm, Smith-Waterman algorithm), Multiple Sequence Alignment, Concept of Gaps, Gap penalties and scoring matrices, FASTA, BLAST, Variations of BLAST, Alignment scores and statistical significance of database searches [8]
- 3 **Genomics:** Genome, Gene structure of prokaryotes and eukaryotes, Concept of ORFs, GC-content, Codon Usage, cDNAs and ESTs, Serial analysis of gene expression (Microarrays). [8]
- 4 **Proteomics:** Introduction to proteome and proteome analysis (2D electrophoresis, Mass spectrophotometry, Protein microarray and X-ray crystallography), Algorithm for modeling protein folding. [9]
- 5 **Phylogenetics:** Introduction to phylogenetics, Parsimony, Molecular phylogenetics, Methods of phylogenetic tree construction [9]

Outcome(s): After completion of the course, students would be able to:

- Explain the basic principles that underpin Bioinformatics analyses, and apply these principles when analysing biological data.
- critically analyse and solve problems in biotechnology.
- Interpret correctly the outputs from tools used to analyse biological data and make meaningful predictions from these outputs.

Text Books: [1]. Peruski and Peruski: The Internet and the new Biology: tools for Genomic and Molecular Research, ASM Publishing House, India.

Reference Books: [1]. Higgins and Taylor, Bioinformatics, Oxford University Press, US.

CA 23. 377

Geographical Information System

**Total Lectures: 40
3-0-0-3**

Prerequisite(s): Computer Fundamental
Data Representation
Computer Graphics

Objective(s): This is designed to provide the students with an understanding of the methods and theories of GIS Analysis that will allow students to apply GIS knowledge and skills to everyday life.

- 1 **Genesis and Progression:** Basic Concepts, Benefits of Computerization of Information, [6]
Users of GIS, Introduction to Real World and Data Model,
Geometric Representation of objects, Level of Measurement, Applications of GIS.
- 2 **Vector Data Models:** Introduction, Spaghetti Model, Topology Model, Data [8]
Compression, Storing Vector Data, Compression, Storing Vector Data.
- 3 **Raster Data Models:** Necessity and Characteristics, Coding and Storage of Raster Data, [8]
Compression of Raster Data, Run Length Encoding, Chain Codes, Block Codes, Quad
Tree Model, Conversion and Contrast between Vector and Raster Models
- 4 **Hardware and Software Requirements for GIS:** Basic Hardware Devices viz Computer, [9]
VDU, Quantizers, Printers, Plotters, etc. DBMS, Structure of Databases,
Multimedia, WWW.
- 5 **Basics of Data Collection:** Digitizing Maps, Scanning, Manual Digitizing, Aerial Photographs, [9]
Photo Interpretation, Remote Sensing, Correction, Surveying

Outcome(s): After completion of the course, students would be able to:

- Summarize GPS elevations and the operating environment for GPS;
- Create spatial data with real time GPS data;
- Recognize discrepancies in data presentations;
- Import GPS data into GIS;
- Evaluate data before transformation for scale and accuracy;

Text Books: [1]. Bernhardsen Tor, "Geographic Information System: An Introduction", 3rd edition, Wiley Publication

Reference Books: [1]. Longley Paul, "Geographic Information Systems and Science", 2nd Edition, Wiley Publication

CA 23. 369

E-Business

**Total Lectures: 40
3-0-0-3**

Prerequisite(s):

Computer Fundamental

Objective(s):

- To introduce the fundamental concepts in the use and application of telecommunications, systems and technology in the e-business environment.
- To introduce new opportunities and expectations created through the use of eBusiness processes enabled by integrating information systems, telecommunications and internet-based technologies.
- To provide hands-on training for designing e-business applications and web sites using the market software packages, web authoring and development tools.

- 1 **Internet as a Business Driver:** Internet, WWW, Benefits of Internet and WWW, Difference between e-Commerce and e-Business, Mobile Internet, Internet Consumers. [6]
- 2 **Introduction to e-Business Trends:** Trends Driving e-Business, Customer Oriented Trends, e-Service Trends, Organizational Trends, Enterprise Technology Trends and General Technology Trends [8]
- 3 **E-Business Models:** Disruptive Technology, e-Business Models, Internet Pricing, e-Cash, Online Retailing, Constructing e-Business ICT Framework. [8]
- 4 **Leveraging the Web for Marketing:** Business Enhancement, Framework for Web Marketing, Web Usability, Content Management, and Impact of Internet on Marketing [9]
- 5 **Online Resources and Deployment:** Meta Search Engines, Boolean, Searching on Internet, Best Practice Web Searching, The Invisible Web [9]

Outcome(s):

After completion of the course, students would be able to:

- Apply the functions of the various types of hardware, software, telecommunications, security and their uses to enable and support integrated, e-Business processes in any organisation;
- Understand the strategies and approaches for the e-business processes engineering;
- Understand the basic methods and procedures involved in planning and controlling the development and modification of an e-Business system in an organisation;
- Understand the concept of input/output devices of Computers and how it works.

Text Books:

- [1]. Ravi Kalakota, Marcia Robinsion, "E-Business 2.0: Roadmap For Success", 2nd Edition, Pearson.
- [2]. Paul Phillips, "E-Business Strategy", 1st edition, TMH.

Reference Books:

- [1]. Colin Combe, "Introduction to e-Business", 1st Edition, Routledge
- [2]. Azhar Kozami, "Business Policy and Strategic Management", 2nd Edition, Tata McGrawHill.

ET 23.465

Agile Software Development

Total Lectures: 40
Credit: 3-1-0-4

Prerequisite(s): Software Engineering

Objective(s):

- To learn the fundamental principles and practices associated with each of the agile development methods.
- To learn how agile methods scale to large and distributed projects.
- To perform in-depth explorations into aspects of agile development that are particularly relevant to each student through detailed discussion sessions.

- 1 **Fundamentals of Agile:** The genesis of Agile, introduction and background, Agile manifesto and principles, overview of Scrum, extreme programming, feature driven development, lean software development, Agile project management, design and development practices in Agile projects, test driven development, continuous integration, refactoring, pair programming, simple design, user stories, Agile testing, Agile tools. [7]
- 2 **Agile Scrum Framework:** Introduction to Scrum, project phases, Agile estimation, planning game, product backlog, sprint backlog, iteration planning, user story definition, characteristics and content of user stories, acceptance tests and verifying stories, project velocity, burn down chart, sprint planning and retrospective, daily scrum, Scrum roles – product owner, Scrum master, Scrum team, Scrum case study, tools for Agile project management. [9]
- 3 **Agile Testing:** The Agile lifecycle and its impact on testing, test driven development (TDD), unit framework and tools for TDD, testing user stories – acceptance tests and scenarios, planning and managing testing cycle, exploratory testing, risk based testing, regression tests, test automation, tools to support the Agile tester, securing Agile software. [10]
- 4 **Agile Software Design and Development:** Agile design practices, role of design principles including single responsibility principle, open closed principle, Liskov substitution principle, interface segregation principles, dependency inversion principle, Agile design, need and significance of refactoring, refactoring techniques, continuous integration, automated build tools, version control. [10]
- 5 **Industry Trends:** Market scenario and adoption of Agile, Agile ALM, roles in an Agile project, Agile applicability, Agile in distributed teams, business benefits, challenges in Agile, risks and mitigation, Agile project on cloud, balancing Agility with discipline, Agile rapid development technologies. [4]

Outcome(s): On successful completion of this course, students will be able to

- Understand concept of agile software engineering and its advantages in software development. Recognize various agile methods.
- Design and manage a project using Agile.
- Write user stories for project requirements.

Text Books:

- [1].Ken Schawber, Mike Beedle, Agile Software Development with Scrum, Pearson, 2008.
- [2].Robert C. Martin, Agile Software Development Principles, Patterns and Practices, Prentice Hall
- [3].Lisa Crispin, Janet Gregory, Agile Testing: A Practical Guide for Testers and Agile Teams, Addison Wesley.

Reference Books:

- [1].Alistair Cockburn, Agile Software Development: The Cooperative Game, Addison Wesley, 2006
- [2].Mike Cohn, User Stories Applied for Agile Software, Addison Wesley, 2004

CA 23. 362

Knowledge Management

Total Lectures: 40
3-0-0-3

Prerequisite(s): Management Information System
Software Engineering
Data Mining and warehousing

Objective(s): To enable students to learn about this practice in the context of managing the design, development and operation of information technologies that can facilitate KM.

- 1 **Introduction:** Definition, Evolution, Types, Implication for Knowledge Management [6]
- 2 **LifeCycle:** Challenges, Difference, Knowledge management system Life Cycle, Comparative Studies Between SDLC and Knowledge Management System Development, Role of Knowledge Developer. [8]
- 3 **Knowledge Creation and Architecture:** Knowledge Codification, Need of Codification, and Knowledge Tools for Codification, Developer Skills Set. [8]
- 4 **Knowledge Transfer and Internet:** Internet and Knowledge, E-Business, Ethical and Legal Issues in Knowledge Management. [9]
- 5 **Executive Information and support Systems:** Business Expert System and AI, OLTO & OLAP; Data Warehousing; Data Marts, Data Warehouse architecture; Tools for data warehousing. [9]

Outcome(s): After completion of the course, students would be able to:

- Analyze the role of knowledge management in attainment of financial objectives, quality and process improvement, and innovation.
- Apply knowledge management models and technologies to business situations.
- Use a knowledge management system for an organization.
- Create a knowledge management plan to leverage opportunities to create, capture, represent and share knowledge within an organization. Understand the concept of input/output devices of Computers and how it works.

Text Books: [1]. Awad, Elias M., "Knowledge Management", TMH, New Delhi
[2]. Kimiz Dalkir, Knowledge Management in Theory and Practice - 2nd Ed. MIT Press 2011

Reference Books: [1]. Inmon, W. H., "Building Data Warehousing", Wiley, New Delhi.
[2]. Han, Jiawei, Kamber, Michelina, "Data Mining Concepts & Techniques", Harcourt India, New Delhi

CA 23. 364

Artificial Intelligence

Total Lectures: 40
3-0-0-3

Prerequisite(s):

- fundamental concepts in calculus, linear algebra and probability theory, for example, vector, matrix, Bayes' rule, differential
- Programming language

Objective(s): Presentation of artificial intelligence as a coherent body of ideas and methods to acquaint the student with the basic programs in the field and their underlying theory. Students will explore this through problem-solving paradigms, logic and theorem proving, language and image understanding, search and control methods and learning.

- 1 **Overview of A.I.:** Introduction to AI, Importance of AI, AI and its related field, AI techniques. [6]
- 2 **Problem space and search:** Defining the problem as a state space search, Production system and its characteristics, Issues in the design of this search problem. [8]
- 3 **Heuristic search techniques :** Generate and test, hill climbing, best first search technique, problem reduction, constraints satisfaction [8]
- 4 **Game Playing:** Minimax, alpha-beta pruning, Predicate logic, representation of simple facts in logic, well formed formula, resolution. [9]
- 5 **Knowledge representation and Learning :** Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation, Introduction learning, Types of learning, Introduction to neural networks. [9]

Outcome(s): After completion of the course, students would be able to:

- Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
- Demonstrate working knowledge in Lisp in order to write simple Lisp programs and explore more sophisticated Lisp code on their own.
- Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems.

Text Books: [1]. Rich Elaine and Knight Kevin , Artificial Intelligence, Tata McGraw – Hill, 3rd edition, 2012

Reference Books: [1]. Russell Stuart and Norvig Peter, Artificial Intelligence: A Modern Approach, Prentice Hall; 3 edition, 2009.
[2]. Patterson D.W., "Introduction to AI and Expert Systems", PHI, 1999

CA 23. 366

Information Security

**Total Lectures: 40
3-0-0-3**

Prerequisite(s): Computer Fundamental and Networking,
Basic Mathematics.

Objective(s): Students will learn the basic concepts in computer security including software vulnerability analysis and defense, networking and wireless security, applied cryptography, as well as ethical, legal, social and economic facets of security. Students will also learn the fundamental methodology for how to design and analyze security critical systems.

- | | | |
|---|---|-------------|
| 1 | Introduction: Information, Characteristics of Information, Security Attacks, security model, Concepts of Policies; procedures; Guidelines and Standards | NSTISSC [6] |
| 2 | Cryptography: Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates. | [8] |
| 3 | IP Security: IP Security Overview, Architecture, Authentication Header, Encapsulation Security Payload, Combining Security Association, Key Management, Pretty Good Privacy, S/MIME and Types. | [8] |
| 4 | Web Security and E-Commerce: Web Security Requirement, SSL and Transport Layer Security, Secure Electronic Transactions, Introduction to E-Commerce, Transactions on E-Commerce, Requirement of Security on E-Commerce. | [9] |
| 5 | System Security: Recognized Security Threats, Virus, Trojan horse, Worm, Spyware, Adware, Key Logger, Denial of Services, Firewall Design Principles, Trusted Systems, Common criteria for information technology security and evaluation. | [9] |

Outcome(s): After completion of the course, students would be able to:

- Identify the security goals of an information system, point out contradictory goals and suggest compromises.
- Understand of the principles underlying cryptography and cryptanalysis and have a technical understanding of the main cryptographic concepts and technologies available today, including symmetric and asymmetric encryption, hashing, and digital signatures.

Text Books: [1]. William Stallings, "Cryptography and Network Principles and Practice", Fourth Edition, Pearson.
[2]. William Stallings, "Network Security Essentials (Applications and Standards)" Pearson.

Reference Books: [1]. Forouzan, Mukhopadhyay, "Cryptography & Network Security", , McGraw Hill
[2]. Godbole "Information Systems Security", , Wiley-India
[3]. Shah Deven "Information Security Principles and Practice", , Wiley-India

CA 23. 368

CyberLaw

Total Lectures: 40
3-0-0-3

Prerequisite(s): Computer Fundamental

Information Security Concept

Objective(s): To give the Students a general knowledge of cyber technology and cyber security. Students will clarify issues of jurisdiction and sovereignty of the internet and be introduced to the basic principles of digital intellectual property, online privacy, and the basic elements of software copyright.

- 1 **Fundamentals of Cyber Law:** Jurisprudence of Cyber Law- Overview of Computer and WebTechnology-IntroductiontoIndian CyberLaw- Overview of GeneralLawsandProceduresinIndia; Freedomof Expression on theInternet. [6]
- 2 **E-commerce-LegalIssues:**ElectronicCommerce–DigitalSignature-Meaning; CreationofDigitalSignature;Understanding howdigitalsignatureswork,Rolein InformationTechnology;technicalissues;legalissues;Crimesrelating todigital signature certificates [8]
- 3 **CyberCrimes:**MeaningofCyberCrimes– CybercrimesunderIPC,Cr.P.CandIndianEvidenceLaw- CybercrimesundertheInformationTechnologyAct,2000 [8]
- 4 **CybercrimesunderInternationalLaw** - [9]
HackingChildPornography,CyberStalking,DenialofserviceAttack,VirusDissemination, Software Piracy,Internet Relay Chat(IRC)Crime,CreditCardFraud,NetExtortion,Phishingetc-Cyber Terrorism - Violation of Privacy on Internet - Data Protection and Privacy
- 5 **Intellectual Property Issues and Cyberspace : The Indian Perspective;** Overview of Intellectual Property related Legislation-Copyright law &Cyberspace; Trademark law &Cyberspace; Law relating to Semiconductor Layout&Design. [9]

Outcome(s): After completion of the course, students would be able to:

- Identify cyber laws and regulatory tools
- Understand the role of government and jurisdiction in technology
- Reflect on cyber laws regarding the internet and IP
- Judge case studies and court outcomes regarding online privacy and cyber security
- Classify cyber privacy, copyright, and software IP

Text Books: [1].Rodney D. Ryder, Guide to Cyber Laws, 2nd Edit, Wadhwa and Company, Nagpur,2007
[2].Sharma,Vakul. Information Technology law and Practice. Universal law Publishing,2011
[3].Rattan, Jyoti. Cyber law. New Delhi: Bharat law House,2011.

Reference Books: [1].Seth,Kanika. Cyber Law in the Information Technology Act. Nagpur : Lexis Nexis Butterworth Wadhwa,2009
[2].Rodney D.Ryder,Guide of Cyber Law,2nd Edition.
[3].FaruqAhmed,Cyber law in India

ET 23.362

Mobile Apps Development

Total Lectures: 40
Credit: 3-1-0-4

Prerequisite(s): CA 19.210 (Java Programming)

Objective(s):

- To learn how mobile apps are different from others traditional apps by learning those aspects of mobile programming that make it unique from other platforms
- Program mobile applications for the Android operating system that use basic and advanced phone features
- Deploy applications to the Android marketplace for distribution.

- 1 **Getting started with Mobility:** Mobility landscape, mobile platform, mobile apps development, overview of android platform, setting up the mobile app development environment along with an emulator, a case study on mobile app development. [8]
- 2 **Building blocks of mobile apps: Apps user:** Interface designing-mobile UI resources (Layout,UI elements, Draw-able,Menu), activity-states and life-cycle, interaction amongst activities. app-functionality beyond user interface- threads, async task, service –state and life cycle, notification, broad cast receivers, telephony and smsapis native data handling-on device file I/O, shared preferences, mobile database such as SQLite, and enterprise data access(via Internet/Intranet) [15]
- 3 **Sprucing up mobile apps:** Graphics and animation- custom views, canvas, animation APIs, multimedia-audio/video playback and record, location awareness, and native hardware access (sensor such as accelerometer and gyroscope). [8]
- 4 **Testing mobile apps:** Debugging mobile apps, whiteboxtesting,blackbox testing, and test automation of mobile app, JUnit for Android, Robotium, Monkey Talk. [6]
- 5 **Taking apps to market:** Versioning signing and packaging mobileapps, distributing apps on mobile market place. [3]

Outcome(s): On successful completion of this course, students will be able to

- Understand the android operating system in details
- Create mobile application for various screens
- Deploy on play store market
- Use various sensors available in mobile

Text Books:

[1].Barry Burd, Android Application Development All in One for Dummies, Johen Wiley & Sons Inc., Edition I , 2011.

[2].AnubhavPradhan ,Anil V Deshpandy, Mobile App Development, Edition

Reference Books:

[1].Lauren Darcey, Shane Conder,“Teach Yourself Android Application Development in 24 Hours”,Sams Publishing, 2012, 2ndEdition , 2012.

CA 23.487

Artificial Neural Networks

Total Lectures: 40

Credit:3-0-0-3

Prerequisite(s): Mathematics

Objective(s):

- To understand the biological neural network and to model equivalent neuron models.
- To understand the architecture, learning algorithms
- To know the issues of various feed forward and feedback neural networks.
- To explore the Neuro dynamic models for various problems.

1. **Introduction:** Artificial Intelligence, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Learning Process: Error Correction Learning, 8
2. **Single Layer Perceptron:** Adaptive Filtering Problem, Unconstrained Organization Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection. 8
3. **Back Propagation:** Back Propagation and Differentiation, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning 8
4. **Self-Organization Maps (SOM):** Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification 8
5. **Neuro Dynamics:** Memory Based Learning: Hopfield Models , Hebbian Learning, Competitive, Boltzmann Learning, Memory, Dynamical Systems, Stability of Equilibrium States, Recurrent Network Paradigm 8

Outcome(s): Upon completing this course, the student will be able to

- Understand the similarity of Biological networks and Neural networks
- Perform the training of neural networks using various learning rules.
- Understanding the concepts of forward and backward propagations.
- Understand and Construct the Hopfield models.

Text Books:

1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.,.
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

Reference Books:

1. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
2. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.

Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005

CA 23.411

Machine Learning

Total Lectures: 40

Credit:3-1-0-4

Prerequisite: Artificial Intelligence

Objective(s):

- To learn the Machine learning concepts.
- To learn different models of Machine learning.

1. **Foundations of Learning:** Components of learning, learning models, geometric models, probabilistic models, logic models, grouping and grading, learning versus design, supervised learning, unsupervised learning, reinforcement learning, theory of learning, feasibility of learning, error and noise, training versus testing, theory of generalization, generalization bound, approximation generalization trade off, bias and variance, learning curve. [8]
2. **Linear Models:** Linear classification, univariate linear regression, multivariate linear regression, regularized regression, logistic regression, perceptron, multilayer neural networks, learning neural networks structures, support vector machines, soft margin SVM, going beyond linearity, generalization and overfitting, regularization, validation. [8]
3. **Distance-based Models:** Nearest neighbour models, K-means clustering, hierarchical clustering, k-d trees, locality sensitive hashing, non-parametric regression, ensemble learning, bagging and random forests, boosting, meta learning. [8]
4. **Tree and Rule Models:** Decision trees, learning decision trees, ranking and probability estimation trees, regression trees, clustering trees, learning ordered rule lists, learning unordered rule lists, descriptive rule learning, association rule mining, first-order rule learning. [8]
5. **Reinforcement Learning:** Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal-difference learning, active reinforcement learning, exploration, learning an action utility function, generalization in reinforcement learning, policy search, applications in game playing, applications in robot control. [8]

Outcome(s):

Students will be able to

- Compare and apply Machine learning models for different problems.
- Carry out research in the area of Machine learning.

Text Books:

- [1] T. M. Mitchell, Machine Learning, McGraw Hill, 1997.
- [2] P. Flach, Machine Learning: The art and science of algorithms that make sense of data, Cambridge University Press, 2012.

Reference Books:

- [1] M. Mohri, A. Rostamizadeh, and A. Talwalkar, Foundations of Machine Learning, MIT Press, 2012.
- [2] S. Russel and P. Norvig, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2009.

CA 23.413

Machine Learning Lab

Total Hours: 26

Credit: 0-0-2-1

Prerequisite: Artificial Intelligence

Objective(s): To learn the implementation of different Machine learning models.

Contents:

- Experiments based upon basic learning models, classification, generalization.
- Experiments based upon linear models of learning.
- Experiments based upon distance models.
- Experiments based upon tree and rule models.
- Experiments based upon reinforcement learning.

Outcome(s): Students will be able to apply and compare different Machine learning models.

CA 23.401

Network Security and Cryptography

Total Lectures: 40

Credits: 3-0-0-3

Prerequisite(s): Basic mathematics, Expertise in programming, Introduction to Algorithms.

Objective(s): This course will provide students with a practical and theoretical knowledge of cryptography and network security. By the end of the course, students should be able to:

- Understand the fundamental principles of access control models and techniques, authentication and secure system design.
- Have a strong understanding of different cryptographic protocols and techniques and be able to use them.
- Apply methods for authentication, access control, intrusion detection and prevention.
- Identify and mitigate software security vulnerabilities in existing systems.

- 1 **Introduction** : Introduction to Cryptography, Security Threats, Vulnerability, Active and Passive attacks, Security services and mechanism, Conventional Encryption Model, CIA model, Math Background : Modular Arithmetic, Euclidean and Extended Euclidean algorithm, Prime numbers, Fermat and Euler's Theorem [6]
- 2 **Classical Cryptography** : Dimensions of Cryptography, Classical Cryptographic Techniques, Block Ciphers (DES, AES) : Feistel Cipher Structure, Simplified DES, DES, Double and Triple DES, Block Cipher design Principles, AES, Modes of Operations [7]
- 3 **Hash and MAC Algorithms** : Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security Of Hash Functions And Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Digital Signatures, Key Distribution Techniques, Kerberos [7]
- 4 **Security in Networks** : Threats in networks, Network Security Controls – Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls – Design and Types of Firewalls, Personal Firewalls, IDS, Email Security – PGP, S/MIME [7]
- 5 **IP Security**: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Intrusion detection, Signature based IDS, Host based IDS. [6]

Outcome(s): At the end of the course the students will be able to do following:

- Understand cryptography and network security concepts and application
- Apply security principles to system design
- Identify and investigate network security threat
- Analyze and design network security protocols
- Conduct research in network security

Text Books: [1] Cryptography And Network Security Principles And Practice Fourth Edition, William Stallings, Pearson Education
[2] Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall

Reference [1] Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR

Books: [2] Cryptography: Theory and Practice by Douglas R. Stinson, CRC press.

CA 23.488	Deep Learning	Total Lectures: 40 Credit:3-0-0-3
Prerequisite(s):	Artificial Neural Networks	
Objective(s):	• To introduce the foundations of Artificial Neural Networks • To acquire the knowledge on Deep Learning Concepts • To learn various types of Artificial Neural Networks • To gain knowledge to apply optimization strategies	
1.	Artificial Neural Networks Introduction: Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.	[8]
2.	Unsupervised Learning Network: Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.	[8]
3.	Introduction to Deep Learning: Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation	[8]
4.	Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier	[8]
5.	Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second Order Methods, Optimization Strategies and Meta-Algorithms Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing	[8]
Outcome(s):	Upon completing this course, the student will be able to - understand the concepts of Neural Networks - select the Learning Networks in modeling real world systems - use an efficient algorithm for Deep Models - apply optimization strategies for large scale applications	
Text Books:	Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.	
Reference Books:	Ian Goodfellow, Yoshua Bengio and Aaron Courville, “ Deep Learning”, MIT Press, 2017. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017 Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012. 5Ethem Alpaydin,"Introduction to Machine Learning”, MIT Press, Prentice Hall of India, Third Edition 2014.	

CA 23.481

Introduction to IoT

Total Lectures: 40

Credit:3-0-0-3

Prerequisite(s): Nil

Objective(s):

- To understand the basics of Internet of things and protocols.
- To introduces some of the application areas where Internet of Things can be applied.
- To learn about the middleware for Internet of Things.
- To understand the concepts of Web of Things

1. **IOT** - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Privacy and Security Issues [10]
2. **IOT PROTOCOLS** - Protocol Standardization for IoT, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE802.15.4, Protocol, Modbus, Zigbee, Network layer, 6LoWPAN, APS layer Security, IoT Open source architecture (OIC) [10]
3. **SENSOR & ACTUATORS WITH ARDUINO** - Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino., Interfacing of Relay Switch and Servo Motor with Arduino [10]
4. **WEB OF THINGS** - Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence. [6]
5. **IOT APPLICATIONS** - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT-A, Hydra etc [4]

Outcome(s): On the successful completion of the course, the student will be able to:

- Understand IoT Architecture
- Demonstrate various sensor interfacing
- Analyze various Physical Computing Techniques.

Text Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014

Reference Books:

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.

CA 23.482

Wireless Sensor Networks & IoT Standards

Total Lectures: 40

Credit:3-0-0-3

Prerequisite(s): Nil

Objective(s):

- To identify and expose the students to the central elements in the design of communication protocols for the WSNs.
- To get the perception of mobile ad hoc networks, design, implementation issues, and solutions based on different algorithms and protocols
- To associate, hardware platforms and software frameworks used to realize dynamic Wireless sensor network

1. Network for embedded systems and Embedded wireless communication: RS232, RS485, SPI, I2C, CAN, Bluetooth, Zigbee, Wifi, UWB [10]
2. Wireless sensor network (WSN): Characteristic and challenges, WSN vs Adhoc Networks, Sensor node architecture, Physical layer and transceiver design considerations in WSNs, Energy usage profile [10]
3. WSN (Medium access control): Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts, Contention Based protocols, Schedule-based protocols - SMAC – BMAC, Traffic-adaptive medium access protocol (TRAMA), The IEEE 802.15.4 MAC protocol. [10]
4. Sensor Network Architecture: Data Dissemination, Flooding and Gossiping-Data gathering Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design Principles for WSNs- Gateway Concepts, Need for gateway, WSN and Internet Communication, WSN Tunneling [7]
5. IP based WSN and Tiny OS: Circuit switching, packet switching, concept of IPV4, IPV6, 6LOWPAN and IP, IP based WSN, 6LOWPAN based WSN, IOT Tiny OS for WSN and IOT, M2M communication [3]

Outcome(s): On the successful completion of the course, the student will be able to:

- Assess the applicability and limitations of communication protocols for a real time WSN application.
- Proactive in understating the routing protocols function and their implications on data transmission delay and bandwidth
- Contribute appropriate algorithms to improve existing or to develop new wireless sensor network applications.
- Familiarize the protocol, design requirements, suitable algorithms, and the state-of-the-art cloud platform to meet the industrial requirement.

Text Books:

- 1 Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks" 2011, 1st ed., John Wiley & Sons, New Jersey
- 2 Pethuru Raj and Anupama C. Raman "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by (CRC Press)

Reference Books:

1. Jun Zheng, Abbas Jamalipour, "Wireless Sensor Networks: A Networking Perspective", 2014, 1st ed., Wiley-IEEE Press, USA.
2. Waltenegus W. Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", 2014, 1st ed., John Wiley & Sons, New Jersey.

CA 23.483

IoT for Industries

Total Lectures: 40

Credit:3-0-0-3

Prerequisite(s): Nil

Objective(s):

- To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.
- To provide Knowledge for the design and analysis of Industry 4.0 and Industry 5.0 Systems.

1. Introduction to Industrial IoT (IIoT) Systems: The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Industry 5.0, Smart Factories. [10]
2. Implementation systems for IIoT: Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, Wi-Fi, and LoRa Protocols and IoT Hub systems. [10]
3. IIoT Data Monitoring & Control: IoT Gate way, IoT Edge Systems and It's Programming, Fog Computing, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology. [10]
4. Cyber Physical Systems: Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis [7]
5. Industrial IoT- Applications: Smart cities, Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management. [3]

Outcome(s): On the successful completion of the course, the student will be able to:

- Knowledge of theory and practice related to Industrial IoT Systems.
- Identify, formulate and solve engineering problems by using Industrial IoT.
- Implement real field problem by gained knowledge of Industrial applications with IoT capability.

Text Books:

1. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: Apress
2. The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications

Reference Books:

1. Inside the Internet of Things (IoT), Deloitte University Press
2. Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications Olivier Hersent, David Boswarthick, Omar Elloumi

CA 23.489 Natural Language Processing Total Lectures: 40
Credit:3-0-0-3

Prerequisite(s): Artificial Neural Networks

Objective(s):

- To introduce the foundations of Natural Language Processing
- To gain knowledge of various language models
- To acquire the knowledge on problems and solutions of NLP and their relation to linguistics and statistics.

1. **Natural Language Processing Introduction: Basics of NLP, [8]**
important terminologies, Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models, Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches
2. **Syntax Analysis: Parsing Natural Language: Dependency grammar, A [8]**
Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues
3. **Semantic Parsing: Introduction, Semantic Interpretation, System [8]**
Paradigms, Word Sense Systems, Distributional Semantics, Word embedding, Lexical Semantics
4. **Discourse Processing: Cohesion, Reference Resolution, Discourse [8]**
Cohesion and Structure Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models
5. **Topic Models: Introduction, Latent Dirichlet Allocation (LDA), Gibbs [8]**
sampling for LDA and its applications, LDA Variants, Entity Linking, Sentiment Analysis

Outcome(s): Upon completing this course, the student will be able to

- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques

Text Books:

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and Imed Zitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

Reference Books:

1. Speech and Natural Language Processing – Daniel Jurafsky & James H Martin, Pearson Publications

CA 23.494

Artificial Neural Networks Laboratory

Total Hours:26

Credit: 0-0-2-1

Prerequisite(s): Programming Language Laboratory

Objective(s):

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms

Contents:

- To apply different data cleaning techniques for filling the missing values in the given data
- to analyze data from a given database by plotting different plots
- Implement various machine learning algorithms(Linear regression , kNN, SVM etc)
- Implement various Logic gates(AND,OR,NOT) using Mc-culloch Pitts Neuron model
- Demonstration of XOR problem
- Implementation of Back propagation algorithm
- Implementation of Memory Based Learning models

Outcome(s): At the end of this course, the student will

- Be able to design and analyze data set .
- Be capable to identify the appropriate machine learning algorithm for given problem.
- Have practical knowledge on the application of machine learning.

CA 23.495

Deep Learning Laboratory

Total Hours:26

Credit: 0-0-2-1

Prerequisite(s): Programming Language Laboratory

Objective(s):

- the basic techniques for handling images and developing algorithms for image processing (quality enhancement, restoration, coding, compression).
- The basic concepts of deep learning

Contents:

- Implementation of Image Transformation Fourier, DCT etc.
- Implementation of Image Enhancement operations.
- Implementation of image degradation and restoration methods
- Implementation of image segmentation and morphological operations.
- Implementation of unsupervised Learning Models
- Demonstration of Regularization techniques for deep learning
- Demonstration of some application of computer vision

Outcome(s): At the end of this course, the student will be able to

- Learn basic image processing techniques for solving real problems.
- have sufficient expertise in both the theory of two-dimensional signal processing and its wide range of applications, for example, image restoration, image compression, and image analysis
- use an efficient algorithm for Deep Models

CA 23.496

Natural Language Processing Laboratory

Total Hours:26

Credit: 0-0-2-1

Prerequisite(s): C Programming Laboratory

Objective(s):

- To introduce the students with the basics of NLP which will empower them for developing advanced NLP tools and solving practical problems in the field.

Contents:

- Demonstration of word analysis
- Demonstration of word generation
- Demonstration of morphology
- Demonstration of N-gram models
- Demonstration of N-gram smoothing

Outcome(s): At the end of this course, the student will be able to

- learn basic NLP techniques for solving real problems.
- design, implement, and analyze NLP algorithms
- design different language modeling Techniques
- have sufficient expertise in the applications of NLP such as sentiment analysis

CA 23.484

Introduction to IoT Laboratory

Total Hours 26
Credit: 0-0-2-1

Prerequisite: Python Programming lab and C Programming Lab.

Objectives: The objective of this course is to:

- Become comfortable with Raspberry Pi board and operating systems used for Raspberry Pi
- Give the basis knowledge about Arduino integration with various sensors.

Programming Language Used: Python

List of Experiments:

1. Getting started with Raspberry Pi, Install Raspbian on your SD card
2. Linux basic commands.
3. Coding simple programs in Python.
4. How to use Python-based IDE (integrated development environments) for the Raspberry Pi and how to trace and debug Python code on the device.
5. How to have your Raspberry Pi interact with online services through the use of public APIs and SDKs.
6. Arduino basic setup, how to install it and use it, shields to extend the functionality of an Arduino based system.

Outcomes: Upon completion of this course, students are able to:

- Works on Raspberry Pi board and able connect the various sensors used in IoT.
- Know the fundamental concepts of IoT using Arduino board.

CA 23.485

SENSORS AND DEVICE LAB

Total Hours 26

Credit: 0-0-2-1

Prerequisite: Introduction to IoT Laboratory(CA 23.4**) and (CA 23.135) C Programming Lab.

Objectives: The objective of this course is to:

- Solve Societal problems with the help of IOT
- Give the basis knowledge about Arduino integration with various sensors.

List of Experiments:

1. Connect an LED to GPIO pin 25 and control it through command line.
2. Connect an LED to GPIO pin 24 and a Switch to GPIO 25 and control the LED with the switch.
3. The state of LED should toggle with every press of the switch Use DHT11 temperature sensor and print the temperature and humidity of the room with an interval of 15 seconds.
4. Use joystick and display the direction on the screen.
5. Use Light Dependent Resistor (LDR) and control an LED that should switch-on/off depending on the light.
6. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.
7. Switch on and switch of a DC motor based on the position of a switch.
8. Convert an analog voltage to digital value and show it on the screen.
9. Create a door lock application using a reed switch and magnet and give a beep when the door is opened.
10. Control a 230V device (Bulb) with Raspberry Pi using a relay.
11. Control a 230V device using a threshold temperature, using temperature sensor.
12. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).
13. Create a web application for the above applications wherever possible with suitable modifications to get input and to send output

Outcomes: Upon completion of this course, students are able to:

- Understanding the implementation of IOT
- Analyze Problem and Designing a Solution
- Understand importance of Technology in the life of common men.

CA 23.486

IoT for Industry Lab

Total Hours 26

Credit: 0-0-2-1

Prerequisite: Introduction to IoT Laboratory(CA 23.4**) and (CA 23.135) C Programming Lab.

Objectives: The objective of this course is to:

- Solve Societal problems with the help of IOT
- Give the basis knowledge about Arduino integration with various sensors.

List of Experiments:

1. Create a traffic light signal with three colored lights (Red, Orange and Green) with a duty cycle of 5-2-10 seconds.
2. Create an application that has three LEDs (Red, Green and white). The LEDs should follow the cycle (All Off, Red On, Green On, White On) for each clap (use sound sensor).
3. Create a web application for the above applications wherever possible with suitable modifications to get input and to send output
4. Switch on and switch of a DC motor based on the position of a switch.
5. Convert an analog voltage to digital value and show it on the screen.
6. Create a door lock application using a reed switch and magnet and give a beep when the door is opened.
7. Control a 230V device (Bulb) with Raspberry Pi using a relay.
8. Control a 230V device using a threshold temperature, using temperature sensor.
9. Create a IOT Water Pollution Monitor system.
10. Make Contactless IOT Doorbell.
11. IOT Smart Parking Using RFID
12. IOT based Manhole Detection and Monitoring System
13. IOT based Smart Energy Meter Monitoring with Theft Detection.

Outcomes: Upon completion of this course, students are able to:

- Understanding the implementation of IOT
- Analyze Problem and Designing a Solution
- Understand importance of Technology in the life of common men.

A student should implement two case studies from the IOT Projects List (Individually or in small group)

1. Wearable Computer with Temperature Distance Sensors
2. Weather Imaging CubeSat with Telemetry Transmission
3. IOT Water Pollution Monitor RC Boat
4. Mountain Climber Health & GPS Tracker
5. Contactless IOT Doorbell
6. IOT Smart Parking Using RFID
7. IOT Contactless Covid Testing Booth Automation
8. IOT Social Distancing & Monitoring Robot For Queue
9. IOT Covid Patient Health Monitor in Quarantine
10. IOT based Manhole Detection and Monitoring System
11. IOT based Smart Energy Meter Monitoring with Theft Detection
12. IOT Weather Station Airship
13. IOT based Three Phase Power Failure Monitoring with SMS Alerts
14. IOT based Intelligent Gas Leakage Detector Using Arduino
15. 360° Aerial Surveillance UAV With IOT Camera
16. IOT Garbage Segregator & Bin Level Indicator
17. IOT Temperature & Mask Scan Entry System
18. IOT based Smart Agriculture Monitoring System Project
19. IOT Based Automatic Vehicle Accident Detection and Rescue System
20. Greenhouse Monitoring and Control System using IOT Project
21. IOT Based Coal Mine Safety Monitoring and Alerting System
22. IOT Based Heart Monitoring System Using ECG
23. IOT based Anti-theft Flooring System using Raspberry Pi
24. Raspberry Pi based Weather Reporting Over IOT

25. IOT Early Flood Detection & Avoidance
26. IOT Garbage Monitoring Using Raspberry Pi
27. IOT Circuit Breaker Project
28. IOT Mining Tracking & Worker Safety Helmet
29. IOT Prison Break Monitoring & Alerting System
30. Raspberry Pi Air and Noise Pollution Monitoring System Over IOT

Note: The Instructor may add/delete/modify/tune experiments

CA 23.405

Cyber Security Laboratory

Total Hours: 26

Credit:0-0-2-1

Prerequisite: Computer Networks/Operating Systems

Objectives: The objective of this course is to:

- Become comfortable with security and privacy applications.
- Provide the foundation for ethical hacking and cyber security.

Contents:

Ethical Hacking Basics

- Penetration Testing
- White Box vs Black Box Versus Gray Box
- Vulnerability Assessment vs Penetration Testing
- Ethical Hacker Responsibilities and Customer Expectations
- Laws and Legal Obligations

Kali Linux Test Lab

- Test Lab Requirements
- Diagram and Design
- Test Connectivity

Kali Linux and Scanning

- TCP, UDP and, ICMP Scanning
- Nmap – ICMP Scan, TCP Scan, Advanced TCP Scans, UDP Scan
- OS Detection, Avoid Detection
- Nmap – Scripts and Script Engine, Troubleshooting
- Metasploit
- Armitage

Kali Linux Exploitation and Backdoors

- Spear Phishing Attacks
- Credential Harvesting with Website Cloning
- Netcat
- John the Ripper

Outcomes: Upon completion of this course, students are able to:

- Apply the knowledge of cyber security in real life
- Helping the society by cyber frauds
- Use of development environment like Eclipse for collaborative programming/editing.

MODY UNIVERSITY
OPEN ELECTIVE CBCS COURSE

Course Code:
ET-18.101

E-Government Processes and Technologies

3-0-0-3

Total Lectures: 39

Objectives:

- Support the government departments, in terms of leading or being part of team responsible for, e-Governance project Conceptualization and design .
 - Support the government departments in effectively planning and managing various phases of e-Governance project development and implementation
 - Leverage the strengths of private sector in e-Governance initiatives through effective procurement approach and manage service delivery throughout project Lifecycle
 - Application of learning and good practices in e-Governance projects implementation to minimise the learning curve and to maximise the benefits for the department
-
1. **Roadmap to e-Government:** Vision and mission of e-government, government to e-government transformation, selection, planning and management of projects, parameters for success and measure of projects, relationship and citizen participation in e-government. [5]
 2. **e-Gov 2.0:** Introduction, e-Gov 1.0 v/s e-Gov 2.0, e-Gov 2.0 financial and technology models. [5]
 3. **Multiple Standards in ICT and Change Management:** Purpose and rationale for multiple standards, areas having multiple standards, rationale for single standard, introduction to change management, model of change management. [6]
 4. **Government Data Centres and Utility Computing :** Elements and complexity of GDCs, virtualization and consolidation of GDCs, architecture of a GDC, utility computing concepts and areas, technical and regulatory issues in utility computing. [7]
 5. **Secured Government Information System Architecture:** Introduction, architectural types, processes, security requirements and policies, steps in designing security architecture. [8]
 6. **Case Studies of few e-Government Projects:** National Citizen Identity System, land records, urban development management system, e-agriculture, e-procurement, RTO, e-mitra etc. [8]

(The contents in this unit are subject to change as per the evolution and progression of novel e-governance projects).

Outcomes: Will have the understanding and knowledge of the following:

- Better access to information and quality services for citizens
- Simplicity, efficiency and accountability in the government
- Expanded reach of governance
- Enabling Environment for Promoting Economic development
- Enhancing Transparency and Accountability:
- Improving Service Delivery:
- Improving Public Administration

Text Books:

1. Jaijit Bhattacharya, “e-Gov 2.0”, 1st edition, Tata McGraw Hill.
2. C.S.R. Prabhu, “e-Governance: Concepts and Case Studies”, 2nd edition, PHI.

Reference Books:

- 1 J. Satyanarayana,” e-Government: The Science of the Possible”, PHI.
- 2 Bidisha Chaudhuri, “E-Governance in India: Interlocking Politics, Technology and Culture”, 1st edition, Routledge.

MODY UNIVERSITY

OPEN ELECTIVE CBCS COURSE

3-0-0-3

Course Code:
ET- 18.103

Application of Electronics in Everyday Life

Total Lectures: 40

Objective: To develop the understanding of Electronics used in daily life as well as understand the principle and working of various instruments used in health care, IoT and communication sector.

1. **ELECTRONICS COMPONENTS:** Resistor and its color code, Capacitor, Inductor, PN diode, Photo Diode, LDR, LED, Zener diode, Varactor diode. [4]
2. **ELECTRONICS IN COMMUNICATION:** Telegraph, Telex, Mobile Phone, Optical Fiber, Transmission Line, Waveguides, Satellite Communication, RADAR, 4G system, Internet, Video conferencing, Fax. [10]
3. **ELECTRONICS IN HOME CARE:** Basic of electricity and electrical cables, Multi meter and basic electronic component, Power supply, UPS/Inverter, SMPS, Washing machine, Microwave oven, Steam iron, Electric rice cooker, Electric kettle, Induction plate. [8]
4. **ELECTRONICS IN IOT:** Introduction, IoT applications for industry: Future Factory Concepts, Smart Objects, Smart Applications, Smart Homes, Structural Monitoring, Buildings, Smart Cities, Transportation Healthcare Warfare, Physical Intrusion Detection, Surveillance. [10]
5. **ELECTRONICS IN HEALTHCARE:** ECG, EEG, Defibrillator, Computed Tomography, Magnetic Resonance Imaging, Glucometer, Sphygmomanometer, Digital and Infrared Thermometer. [8]

Outcomes:

At the end of this course, the student should be able to

1. Know about fundamentals of Electronic Components.
2. Understand the concept of Communication.
3. Understand the concepts of electronics behind various home appliances.
4. Learn about basics of health care equipment.

Text Books:

1. Ben G. Streetman, Sanjay Kumar Banerjee: Solid state Electronic Device Electronics, Sixth Edition, Prentice Hall.
2. Adel S. Sedra, Kenneth C. Smith: Microelectronic circuit, Sixth Edition, Oxford.
3. Richard. C. Jaeger, "Microelectronic Circuit Design", Tata McGraw-Hill Companies Inc., International Edition.

Reference Books:

1. B. P. Lathi, "Modern Digital and Analog communication Systems", Oxford University Press, 2010.
2. William C. Y. Lee, Mobile cellular telecommunication – Analog and Digital systems, McGraw Hill, 2nd Ed, 2006

MODY UNIVERSITY

OPEN ELECTIVE CBCS COURSE

Course Code:
ET-18.104

Energy Sources & Sustainable development

3-0-0-3
Total Lectures: 39

Objective(s): *The course is designed to give knowledge of various energy sources and basics of power production techniques. It lays emphasis on basic understanding of green energy technology and its importance for environment and sustainable development.*

1. **World Energy Status:** Present Situation and future Energy Scenario, Evolution of Energy [14]
Security; India's Energy Scenario; Introduction to nexus between Energy, Environment, and Sustainable development and Climate Change and societal issues
Conventional Energy Sources: Fossil Fuel, Coal, Oil, Gas, Thermal Power Stations, Hydro power generation, Comparison of various conventional energy systems, their prospects and limitations
Scenario of Green Energy Sources: Difference between conventional and renewable energy systems, Needs and advantages of green energy sources, social implications.
2. **Solar Energy:** Principles of photovoltaic generation of electricity; Silicon cell; Photon [14]
absorption; Cell efficiency; Solar cell construction; Types and usage of photovoltaic systems. solar cell modules and arrays, solar cell types, material, applications, advantages and disadvantages, solar energy conversion into heat, types of solar collectors, cylindrical parabolic collector, solar energy thermal storage.
Nuclear Energy: Present Status of Nuclear Power; Nuclear Fission & Fusion, National Nuclear Power Program,, Natural Radioactivity, Radioactive Decay, Radiation Doses, various types of nuclear power plants, Nuclear Reactor Safety, Fusion reactor
3. **Wind Energy:** Energy available from wind, basics of wind energy conversion system, [6]
classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, and applications.
Bio Energy: Types of biogas plants, biogas generation, factors affecting biogas generation, advantages and disadvantages, biomass energy, energy plantation, gasification
4. **Ocean Energy:** Ocean energy resources-ocean energy routes - Principles of ocean thermal [5]
energy conversion systems- ocean thermal power plants- Principles of ocean wave energy conversion and tidal energy conversion.
Geothermal energy: Introduction, vapor and liquid dominated systems, binary cycle, hot dry rock resources, magma resources, advantages and limitations

Outcome(s): *After learning the subject, student will be able to understand the basic principle of power production from different energy sources. Advantage of renewable and green energy sources for sustainable development and environmental issues related to energy sources and societal implications*

Text Books:

1. S.P. Sukhatme, Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill
2. C. S. Solanki, "Solar Photovoltaics: Fundamental Applications and Technologies, PHI, 2009
3. S. Glasstone & A. Sesonkse, Nuclear Reactor Engineering, CBS, 2004
4. D. A. Spera, Wind Turbine Technology: Fundamental concepts of Wind Turbine Engineering, ASME Press.

Reference**Books:**

1. Non-conventional energy resources, Shobh Nath Singh, Pearson India
2. Principles of Solar Energy, Frank Krieth& John F Kreider, John Wiley, New York
3. David Bodansky, Nuclear Energy: Principles, Practices and Prospects, Springer 2004.

Mody University
College of Architecture and Design (CAD)
Open Elective in Free hand sketching for all Undergraduate Programmes

3-0-0-3

Paper Code: FH 141

Paper Name: FREEHAND SKETCHING

Learning Objectives:

1. To ensure that students begin to understand pencils, grades, holding to sketch.
2. To provide students an exposure to express with sketching and understand proportions.
3. To gain skill of sketching indoors.
4. To enhance ability to sketch outdoors.
5. To develop rudimentary ability to use pencil as a media in sketching.

CONTENTS

Unit - I. Introduction to Graphic Skills: **[04]**

Understanding the meaning of graphic skill; basic techniques, types of pencil shades and grades.

Unit - II. Geometry of Objects **[10]**

Understanding geometry of an Object, Free hand sketching of an object, object in different eye level, Optical illusions, effect of light on object.

Unit –III. Fundamentals of Perspective **[05]**

Diminution, Foreshortening, convergence, overlapping shades and shadow

Unit - IV. Outdoor Sketching & Indoor Sketching: **[10]**

Outdoor:

Sketching buildings, road activity, Landscape, Environmental scenes, principles of perspective drawing, natural forms, built form, their texture.

Indoor: **[10]**

Sketching of an arranged objects, indoor activity, still life, furniture, equipment, understanding depth, light, shade, shadow; memory drawing.

Expected Outcome:

Students learn and able to draw freehand sketch scenes with addition detailing of foreground and background from pencil effectively on paper.

Suggested Readings

- Buildings; Ian Sidaway, : New Holland Publishers.
- Perspective; Milind Mulick, : Jyotsana Prakashan.
- The fundamentals of Water colour Paintings; D. Carter: Arcturus Publishing Ltd
- Drawing for designers; Koptievsky: Sterling Publishing
- Rendering with pen & Ink; .R.W Gill: Thomas & Hudson
- Drawing and designing with confidence: A step by step guide; M.W Lin: John Wiley & Sons
- Perspective drawing Handbook; Joseph D'Amelio: Dover Publication
- Urban Sketching a complete guide; Thorspecken: Search Press

Evaluation Scheme: 20%=Internal, 80%=End term

MODY UNIVERSITY OF SCIENCE AND TECHNOLOGY

Open Elective CBCS course

Course Title: Vedic Knowledge

3-0-0-3

Course Code: VK 111

Course Description:

Unit-1 History of Vedic Literature

(13)

1. Importance of Vedas in Indian Tradition (भारतीय परम्परा में वेदों का महत्त्व)
2. The emergence of the Vedas (वेदों का आविर्भाव)
3. Introduction of Vedic Svara (वैदिक स्वर परिचय)
4. Definition of Sukta (सूक्त की परिभाषा)
5. Introduction of Rig-veda: Samhita, Brahmana, Aranyaka and Upanishad.
(ऋग्वेद का परिचय -संहिता,ब्राह्मण,आरण्यक एवं उपनिषद -)
6. Introduction of Yajur-veda: Samhita, Brahmana, Aranyaka and Upanishad.
(यजुर्वेद का परिचय - संहिता,ब्राह्मण,आरण्यक एवं उपनिषद)

Unit -2 Suktas related to Rigveda Samhita (Shakalashakha)

(11)

- | | | |
|---------------------------|---------------------|--|
| 1. Lord of fire : | Agnisuktam | (अग्निसूक्तम्-ऋग्वेद 1/1/1-4) |
| 2. Lord of creation : | Vishnusuktam | (विष्णुसूक्तम्-ऋग्वेद 7/100/1-3) |
| 3. Lord of omniscient : | Brahmanaspatisuktam | (ब्रह्मणस्पतिसूक्तम्-ऋग्वेद 1/40/1-4) |
| 4. Lord of pre-creation : | Hiranyasuktam | (हिरण्यगर्भसूक्तम्- ऋग्वेद 10/121/1-3) |
| 5. Goddess of Glory : | Shreesuktam | (श्रीसूक्तम्-ऋग्वेद-परिशिष्ट 1-4) |

Unit-3 Suktas related to ShuklaYajurved Samhita(Madhyandinashakha)

(15)

- | | | |
|-------------------------------|--------------------|---------------------------------------|
| 1. God of wisdom : | Ganapatistavanam | (गणपति-स्तवनम् -यजुर्वेद – 23/19) |
| 2. Identification of nation : | Rashtrageetam | (राष्ट्रगीतम् -यजुर्वेद - 22/22) |
| 3. Good faith : | Svastivachanam | (स्वस्तिवाचनम् -यजुर्वेद-14/19,21-22) |
| 4. Perception power : | Medhasuktam | (मेधासूक्तम् -यजुर्वेद -32/13 -16) |
| 5. Concept of mind : | Shivasuktam | (शिवसंकल्पसूक्तम् -यजुर्वेद -34/1-6) |
| 6. Origin of creation : | Purushasuktam | (पुरुषसूक्तम् (यजुर्वेद-31/1-4,7,16) |
| 7. Goddess of learning : | Sarasvati-stavanam | (सरस्वती-स्तवनम् (यजुर्वेद -20/84-86) |

Text books :-

1.Vedic Sukta Sangrha: (Code No.1885) 7th Edn. Pub. Gita Press Gorakhpur

(वैदिकसूक्त-संग्रह – प्रकाशक - गीताप्रेस, गोरखपुर)

2. Vedic Sukta Sangrha: Acharya Bheshraja Sharma First Edn. Pub. Hansa prakashan Jaipura (वैदिकसूक्तसंग्रह - आचार्य भेषराज शर्मा, हंसा प्रकाशन, जयपुर)

3. Vedic Sangraha: Dr. Krishna Lal First Edn. Pub.Istarna book Linkarsa Delhi. (वैदिक संग्रह डा कृष्ण लाल ,ईस्टर्न बुक लिंकर्स , दिल्ली)

Reference books:-

1. RigvedaSamhita: Acharya Shri Ram Sharma Publishers-Yuganirmana Yojana, Mathura U.P. (ऋग्वेदसंहिता - आचार्य श्रीराम शर्मा प्रकाशक युग निर्माण योजना मथुरा उ.प्र)

2. Yjurveda: Acharya ShriRam Sharma Publishers Yuganirmana Yojana,Mathura U.P. (यजुर्वेदसंहिता- आचार्य श्रीराम शर्मा प्रकाशक युग निर्माण योजना मथुरा उ.प्र)

3. Vedas: The source of Ultimate science: Dr. Shri Ram Varma, Nag Publishers Delhi.

4. Vedic Sahitya ka Itihasa aur sanskriti: Shri Baldeva upadhyay Publishers Sharadasansthan Varanasi .U.P.

5. Vedic dicsnory: Bhagavad Datta and Hansaraja Publishers- VishvBharti Anusandhan prishada Gyanpura U.P. (वैदिककोश - भगवद दत्त एवं हंसराज प्रकाशक –विश्वभारती अनुसंधान परिषद् ज्ञानपुर उ.प्र.)

MODY UNIVERSITY

OPEN ELECTIVE CBCS COURSE

Course Code:
ET-18.102

Web Designing and Mobile App Development

3-0-0-3
Total Lectures:40

Objectives: On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers.

1. Concept of Internet A brief Introduction to the Internet: Computer Networks, Internet, URL (Uniform Resource Locator), Internet Service Provider, Intranet, Extranet, Virtual Private Network. Application of Internet: World Wide Web, Search Engines, News groups, Electronic Mail, Web Portal, Chat, Video Conferencing, FTP, Remote Login, E-Commerce, E-Learning, EGovernance, E-Banking. [9]

2. Static Web Page Development Basics of HTML: What is Internet Language?, Understanding HTML, Create a Web page, Linking to other Web Pages, Publishing HTML Pages, Text Alignment and Lists, Text Formatting Fonts Control, Email Links and link within a Page, Creating a Table, Creating HTML Forms, Creating Web Page Graphics, Putting Graphics on a Web Page, Custom Backgrounds and Colors, Creating Animated Graphics. [9]

3. Dynamic Web page Development Cascading Style Sheet: CSS, Defining Style with HTML Tags, Features of Style Sheet, Style Properties, Style Classes, External Style Sheet [8]

4. JavaScript Introduction to JavaScript: Writing First Java Script, External JavaScript, Variables: Rules for variable names, Declaring the variable, Assign a value to a variable, Scope of variable, Using Operators, Control Statements, JavaScript loops, JavaScript Functions: Defining a Function, Returning value from function, User define function. [9]

5. Android: Introduction to android OS, Versions of Android, Introduction to Android Studio, Different GUI Elements of Android Programming, WebView, Convert any Website to android apk. [5]

Outcomes:

- Students are able to develop a dynamic webpage by the use of java script and DHTML.
- Students will be able to write a well formed / valid XML document.
- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.

- Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

Text Books:

1. Teach Yourself HTML 4 in 24 Hours By Dick Oliver (Tech media) 4th edition
2. The Complete Reference JavaScript By Thomas Powell & Fritz Schneider 2nd Edition.
3. Jerome (J.F) DiMarzio “Android A programmer’s Guide” Tata McGraw-Hill 2010 Edition.

Reference Books :

1. HTML, DHTML, JavaScript, Perl CGI By Ivan Bayross(BPB) 3rd Edition
2. CSS By Kynn Bartlett(Pearson Education)2nd Edition
3. Introduction to Internet & HTML Scripting By Bhaumik Shroff Books India Publication 3rd Edition.

MODY UNIVERSITY OF SCIENCE AND TECHNOLOGY

The Bhagavad-Gita

Pre-requisite(s): Basic interest in Indian culture. Sanskrit verses in *Devanagari* script as well as in transliteration forms are provided for further references only; knowledge of Sanskrit is not required as the medium of instruction is English, however it may be an added advantage. Familiarity with the *Devanagari* script may be useful at times.

Course Objectives: The primary aim of the Bhagavad-Gita Course is to make the glorious ‘Gita way of life’ accessible to anyone who yearns for it, or is just curious to know more in a convenient yet effective manner. It provides a holistic, insightful coverage of the entire text in a lucid and simple style without compromising on the salient features of this priceless knowledge. Providing inputs in the modern context for continuous improvement it becomes a practical manual to live a transformed life of goodness and greatness. The course seeks to help students negotiate the text independently without referring to the traditional commentaries so as to enable them to experience the richness of the text and its philosophy.

Evaluation Process: The evaluation pattern would have following two components:

1. Internal component of 20 marks, which can be assessed in one of the following ways at the discretion of course coordinator
 - a. Assignment
 - b. Written test
 - c. Presentation
 - d. Viva
 - e. Model preparation
 - f. Practical assignment
2. An end term examination of 80 marks.

Course Description:

BG 111	The Bhagavad-Gita	3-0-0-3
Introduction: Background of the Mahabharata War, Author (Vedavyasa), Background of the Bhagavad-Gita: knowledge given in the battlefield of life, The role of Gita in our life, Overview of the chapters, The Distress of Arjuna		[03]
Cognitive and Emotive Apparatus: Hierarchy of senses, <i>manas</i> , <i>buddhi</i> and <i>ātman</i> - III.42, XV.7 Role of the <i>ātman</i> -XV.7, XV.9 Mind as a product of <i>prakṛti</i> VII.4 Properties of three modes and their impact on the mind-XIII. 5-6; XIV.5-8, 11-13; XIV.17		[08]
Controlling the Mind: Confusion and conflict: Nature of conflict I.1; IV.16; I.45; II.6 Causal factors-Ignorance-II.41; <i>Indriya</i> -II.60, Mind-II.67; <i>Rajoguna</i> -III.36-39; XVI.21; Weakness of mind- II.3; IV.5		[09]

Means of controlling the mind: Meditation–difficulties –VI.34-35; procedure VI.11-14 Balanced life- III.8; VI.16-17 Diet control- XVII. 8-10 Physical and mental discipline – XVII. 14-19, VI. 36.	
Means of Conflict Resolution: Importance of knowledge – II. 52 ; IV.38-39; IV.42 Clarity of <i>buddhi</i> – XVIII.30-32 Process of decision making – XVIII.63 Control over senses – II.59, 64 Surrender of doer-ship –XVIII .13-16; V.8-9 Desirelessness- II.48; II.55 Putting others before self – III.25	[10]
Self Management through Devotion: Surrender of ego – II.7 ; IX.27; VIII.7; XI.55 ; II.47 Abandoning frivolous debates – VII.21, IV.11; IX.26 Acquisition of moral qualities - XII.11; XII.13-19 Conclusion: Arjuna's realization, Lasting property, Total victory- XVIII.73,78	[09]

Text Book:

Srimad Bhagavadgita(with English Translation and Transliteration, Code 1411), Gita Press, Gorakhpur

Reference Books:

1. Shrimadbhagavadgitarahasya or Karmayogashastra: The Hindu Philosophy of Life, Ethics, and Religion (Original Sanskrit Stanzas with English Translation), Balgangadhar Tilak & Balchandra Sitaram Sukthankar, J.S. Tilak & S.S. Tilak
2. Shrimadbhagavadgita-Tattvavivechani (English Commentary by Jayadaya Goyandaka), Gita Press, Gorakhpur
3. Shrimadbhagavadgita:A Guide to Daily Living (English Translation and notes by Pushpa Anand), Arpana Publications
4. Shrimadbhagavadgita:The Blessed Lord's Song Paramananda, The Vedanta Centre
5. The Art of Man Making (114 short talks on the Bhagavadgita), Chinmayananda, Central Chinmay Mission Trust, Mumbai
6. Essays on the Gita, Shri Aurobindo, Shri Aurobindo Ashram, Pondicherry
7. Managing One-Self (Shrimadbhagavadgita: Theory & Practice), Panchamukhi V.R., Panchamukhi Indological Research Centre, New Delhi & Amar Granth Publications, Delhi
8. Science of Bhagavadgita (A Study of Ancient Wisdom through Modern Science),Virajeshwar, Himalayan Books, Connaught Place, New Delhi
9. Shrimadbhagavadgita through the Eyes of a Scientist, Manhas M.S., B.R. Publishing Corporation, Delhi

Mody University

Open Elective in English for all Undergraduate Programmes

Paper Code: EL 100

Credits: 3-0-0-3

Paper Name: Essential English

Contents:

Reading Comprehension

[11]

To develop skills such as vocabulary building, efficient reading and note-taking.

Poetry

1. Milton: On His Blindness
2. Shakespeare: Let Me Not to the Marriage of true minds
3. Wordsworth: The Solitary Reaper
4. William Butler Yeats: A Prayer to my daughter
5. Browning: My Last Duchess
6. Nissim Ezekiel: Night of the Scorpion

Prose

- (1) Francis Bacon: Of Studies
- (2) R.K. Narayan: Engine trouble
- (3) O. Henry : The Gift of the Magi
- (4) Oscar Wilde : The Nightingale and the Rose

Grammar and Usage

[16]

Tenses and their different forms (present, past and future), their uses and sequences of tenses. Articles, auxiliaries and modals, Preposition, Rules of conversion from direct to indirect speech, expressions of time and place, questions in indirect speech, commands, requests and advice in indirect speech. Spotting the errors in spelling, tenses, prepositions, articles and how to avoid them.

Business Letter Writing

[6]

Layout of formal letters, difference between British and American pattern of letter writing and different types of letters (Job application letter, invitation letter, letter of request)

Idioms and Phrasal Verbs: Understanding idioms, collocations, introduction to phrasal verbs, verb and preposition/ adverb combination, usage of idioms and phrasal verbs.

Vocabulary Building: One word for many, Synonyms and Antonyms, words commonly misspelt and mispronounced.

[6]

Text Books:

1. Jain, Jasbir (ed): Strings of Gold, Delhi, Macmillan Ltd. (1994/ Latest Edition).
2. Lockett, C. H (ed): The Art of the Essayist, Delhi, Longman Group Ltd. (Latest Edition).
3. Murphy and Reynold: Essentials of English grammar, Cambridge University Press, 4th printing 2007.

References:

1. Andrea J. Rutherford: Basic Communication Skills for Technology; Pearson Education, New Delhi, 2nd edition, 2002.
2. R.C. Sharma and Krishna Mohan: Business Correspondence and Report Writing; Tata McGraw-Hill Publishing Company Limited, New Delhi, 2nd edition, 1999.
3. R.P. Bhatnagar: English for Competitive Examinations; Macmillan India Ltd., 5th edition, 1998.
4. T.Balasubramaniam: A Textbook of English Phonetics for Indian Students; Macmillan India Ltd., 15th edition, 2001.
5. Sharon J. Gerson and Steven M. Gerson: Technical Writing; Pearson Education Asia, New Delhi, 3rd edition, 2001.
6. A.J. Thomson and A.V. Martinet: A Practical English Grammar; Oxford University Press, New Delhi, 4th edition, 1986.

MODY UNIVERSITY OF SCIENCE & TECHNOLOGY
College of Fashion Design & Merchandising
Bachelors of Design (Fashion Design) BFD
Autumn (2015-16)
First Year
FOUNDATION PROGRAMME

Total L & P: 45
3-0-0-3

Title of Course: Fashion in Everyday Life

Semester: Autumn

Course Code: FD 115

Pre-requisite(s): Basic interest in fashion and trends

Course Objectives: This course will give the students overview of fashion and its use in everyday life considering trends, forecast; body anatomy, colour preferences and styling techniques. The course will also elaborate on fashion market segments while giving an idea on leading fashion brands, designers and trendsetting celebrities

Course Description:

- Basic Introduction to Fashion: Brief Introduction to fashion and regularly used fashion terminologies, Overview of types of clothing such as Formal Wear, Casual Wear, Evening Wear, Ethnic Wear, Traditional Wear etc., Fun facts related to fashion (3)
- Body Analysis: Triangular figure study, Eight headed figure, Hour glass structure, Vital statistics, Clothing suggestions as per body types (3)
- Practical Colour Study in Fashion: Colour selection in clothing as per skin – tones for day wear and evening wear (6)
- Styling tips with ensembles – An introduction to fashion styling, Exploring various mix and match combinations like print plain combination, combining ethnic and western fashion elements, etc. - **GO, get the desired look!!** (5)
- Fashion Market Segments – A brief insight to different consumer market segments in fashion such as Haute Couture, Pret a Porter (Ready to Wear), Semi Couture, Premium Fashion, High Street fashion, Street fashion, Bridge Fashion, Fast fashion, etc. in context of products, features and service (3)
- Fashion Brands – To Study and compare national and international women's wear fashion brands such as Prada, Dior, Chanel, LVMH, Zara, Aldo, Biba, W, Elle, Aakruti, FabIndia, AND, etc. across market segments and their incorporation by consumers in everyday life (5)
- Fashion Designers – A brief look into the profile and work of renowned Indian and International fashion designers like Manish Malhotra, Sabyasachi Mukherjee, Manish Arora, Ritu Beri, Ritu Kumar, Coco Chanel, Yves Saint Laurent, Giorgio Armani, Christian Dior, Prada, etc. who changed the fashion industry (10)

- Trailblazers of Fashion: To study the role of celebrities (David Beckham, Lady Gaga, Sonam Kapoor, Hrithik Roshan, etc.) red carpets (Oscars, Golden Globes, Filmfare Awards, IIFA, etc.) movies (Piku, Tanu Weds Manu, Dil Dhakadne Do, Devil Wears Prada, etc.) television series (Sex and the City, Gossip Girls, Two Broke Girls, Roadies, Splitsvilla, etc.) on the fashion trends at Indian and Global level (10)

Learning Outcomes:

- Demonstrate a basic knowledge of fashion and common fashion terms
- Understand clothing selection with respect to body type and colour tones while applying basic styling tips to get desired looks
- Explore and evaluate different fashion brands, fashion designers and other popular influencers of fashion

Reference Books:

1. Malcom Barnard, UK March 2014. *Fashion Theory: An Introduction*. Routledge Publishers
2. Harriet Worsley, UK. August 2011. *100 Ideas that Changed Fashion*. Laurence King Publishing
3. Helen Warner. UK April 2014/US June 2014. *Fashion on Television- Identity & Celebrity Culture*. Bloomsbury Academic
4. Pamela Church Gibson. UK December 2011/US December 2011. *Fashion & Celebrity Culture*. Berg Publishers
5. Shanon Burns. UK April 2013/US February 2013. *Style Wise- A Practical Guide to Becoming A Fashion Stylist*. Fairchild Books
6. Patrizia Caietato. Translated by Lisa Adams. UK April 2014/US June 2014. *Luxury- Fashion, Lifestyle & Excess*. Bloomsbury Academic
7. Laura Eceiza, UK. 2008. *Atlas of Fashion Designers*. Rockport Publishers
8. Mark Tungate, UK. 2008. *Fashion Brands*. Kogan Page Limited

Evaluation Process:

Course Work: 50% weightage. It includes Quiz

Exam: 50% weightage. It includes running jury of fashion display

Other Study Material:

- 1) Websites: www.highheelconfidential.com, www.theblondesalad.com, www.stylebubble.co.uk, www.weworewhat.com, www.wendyslookbook.com
- 2) Handouts: As indicated by the course instructor
- 3) Magazine & Other Reading Material: Vogue, GQ, Elle, Harper Bazaar, Jaipur Times

Mody University of Science and Technology

Open Elective in Law for all Undergraduate Programmes Choice Based Credit System (CBCS)

Paper Code: LF 100

Credits: 3-0-0-3

Paper Name: Gender Justice and the Law

Position of Women in Vedic, Post Vedic & Medieval period	[03]
Constitutional Provisions and Gender Justice – Relevant provisions relating to women in Fundamental Rights, Directive Principles of State Policy and Fundamental Duties etc. under the Indian Constitution	[06]
Laws Relating to Marriage, Divorce, Maintenance, Adoption and Succession under the relevant personal laws with special emphasis on Women and Maintenance under Code of Criminal Procedure, 1973	[12]
Provisions under the Indian Penal Code, 1860 (Sec. 292, 293, 294, 304B, 326A, 326B, 354, 354A, 354B, 354C, 354D, 370, 370A, 375, 376, 376A to 376E, 359 to 374, 494, 495, 497, 498A, 507 & 509)	[10]
Provisions under the Code of Criminal Procedure, 1973- relating arrest, search & seizure	
Socio-Legal position of women and the law – Dowry Prohibition Act, 1961 – Protection of Woman against Domestic Violence Act, 2005, The Prohibition of Child Marriage Act, 2006	[06]
Free Legal Aid for Women	[02]

Text Books: -

1. Myeni, Women and Law, Asia Law House, (2008)
2. Rao Mamta, Law Relating to Women and Children, EBC(2010)

Reference Books: -

1. Jaishigh Indira.: Law of Domestic Violence, New Delhi, ULPCo. (2007)
2. Anand Justice A.S.: Justice for Women- Concerns and Expressions, Jaipur, Bharat Law House (2004)
3. Jain M. P., Constitution of India, Recent Edition
4. Shukla V. N., Indian Constitution, Recent Edition
5. Goel A, Kaur M.: Violence Against Women: Issues and Perspectives, Deep & Deep Publication (2006)
6. Ajnes Flavia, Law as Gender Inequality, Oxford University Press (1999)
7. Relevant Reports of the Law Commission of India

Objectives: This course is intended to provide engineering students with a solid foundation in terms of the vital role played by entrepreneurs and entrepreneurship in the 21st century global economy.

Entrepreneurship: Definition and concept of entrepreneurship, [5]
Entrepreneur Characteristics, Classification of Entrepreneurs, Role of Entrepreneurship in Economic Development, Start-ups.

Idea Generation and Project Formulation: Ideas in entrepreneurship, [6]
Sources of new ideas, Techniques for generating ideas, Guidelines for report preparation, Project appraisal techniques, EDP organizations - MDI, EDII, Industrial Sickness and Role of BIFR.

Institutions Supporting and Taxation Benefits: Central level institutions - [5]
NABARD, SIDBI, KVIC, State Level Institutions – DICs, SFC, Government policy for MSMEs, Tax incentives and concessions.

Small Scale Industries (SSI): Concept, Evolution, Role, Problems and [5]
prospects, Policies governing SSIs, Organizational structure, Ownership pattern, Export potential of SSIs.

Project Identification and Financial Analysis: Meaning of project, project [5]
identification, formulation, feasibility analysis, Economic analysis, Financial analysis, Market analysis.

Outcome By the end of the course, students should be able to:

- Recognize the entrepreneurial potential within self and others in their environment.
- Identify the ways in which entrepreneurship manifests itself, including start-up contexts, corporate contexts, social contexts, public sector contexts, and others;
- Appraise the nature of creative new business concepts that can be turned into sustainable business ventures;
- Identify the financial, marketing, legal, human resource, operations, and general management skills that are necessary to successfully launch and operate a successful new venture.

Text Books 1. Khanna, S. S., Entrepreneurial Development, S. Chand, New Delhi.
2. Hisrich D. Robert, Michael P. Peters, Dean A. Sheperd, Entrepreneurship, McGraw-Hill.

Reference Book 1. Kuratko, F. Donald, Richard M. Hodgetts, 'Entrepreneurship: Theory, Process, Practice', Thomson, 7ed.
2. Gupta, C B. and Shrinivasan, N.P., 'Entrepreneurship Development in India', Sultan Chand & Sons, New Delhi.

Objective: To create an awareness on professional ethics and human values, To instill moral and social values and loyalty and to appreciate the rights of others.

Pre-requisite:

1. **Introduction to Human Values:** Morals, Values and Ethics – Happiness & Prosperity [5]
Truth, Rights Conduct (Righteousness), Love, non-violence and peace, Humility and character. Core areas of ethics: Social ethics, Personal ethics Integrity and Trustworthiness, Honesty, Loyalty, Courage, Prudence, Confidence, Confidentiality.
2. **Understand the Harmony:** Understanding the harmony as co-existing of self and body. Understanding my self, harmony in the family and society harmony in nature. [4]
3. **Professional Ethics:** Introduction, meaning of work ethics, professional ethics for Journalists, Physicians, Lawyers, Engineers and Accountants. Intellectual property Rights, scope of ethics, code of conduct, business values and inner consciousness, Ethics at the workplace cybercrime, plagiarism, misconduct, fraudulent use of institutional resources, etc. [7]
4. **Corporate Social Responsibility:** Evolution of Corporate Social Responsibility (CSR) in India, CSR models, CSR to different stakeholders, Corporate Social Responsibility Initiatives of Major Companies of India, Promoting value based governance in organization. Whistle blower policy. [6]
5. **Ethics and Environment:** Introduction to environmental Issues- Industry and Environmental Pollution, Ethics of Controlling environmental pollution – Impact of environmental pollution on human health – Rights, Duties and care in environmental protection - Sustainable development. [4]

Outcome: The students will understand the basic perception of profession, professional ethics, various moral issues and uses of ethical theories.

Text Books: 1. B.N Ghosh “Business Ethics and Corporate Governance”, McGraw Hill Education, Chennai, 2016
2. John R Boatright, “Ethics And The Conduct Of Business”, Pearson Education, New Delhi, 2013.

Reference Books: 1. Raju Ramachandran, “Professional Ethics: Changing Profession and Changing Ethics”, LexisNexis, Butterworths, 2nd Edition 2014.
2. Andrew Crane and Dirk Matten, “Business Ethics”, Oxford University Press, 2nd Edition, 2015.
3. S.K Mandal “Ethics in Business and Corporate Governance” McGraw Hill Education, New Delhi, 2013.
4. R. Subramanian “Professional Ethics”, Oxford University Press, 2015.

Objectives: This course introduces students to the principles of leadership and management practices. It will consider how one manages oneself, others, and resources in the pursuit of a well-defined purpose. It acquaints students with the methods managers use to: assess the environment in which the organization operates; design, build, and implement the organization's capacity to serve; make decisions; and evaluate the efficacy of those decisions.

Introduction to Management: Meaning and importance, Concept of industrial management, Levels of management, Management theories-classical, neo-classical and modern, Managerial roles (Mintzberg), Managerial competencies, Managers and environment. [5]

Management Functions: *Planning* – Concept, types, Strategic planning, Types of strategy, Decision making, Techniques for individual and group decision-making; *Organizing* – Concept, Design of organization structures, Departmentalization, Power and authority, Conflict and coordination; *Staffing* – Concept, Human resource planning, Recruitment and selection. [6]

Contemporary Issues in Management: Management challenges of the 21st Century, Factors reshaping and redesigning management purpose, Performance and reward perceptions, Internationalization, Digitalization, Entrepreneurship, Values and Ethics. [5]

Introduction to Leadership: Concept, Leadership theories (Trait, Behavioral, Situational), Leadership styles, Leadership behavior, Women as leaders, Leadership development, Leadership and change, Leadership and innovation (Audience analysis and engagement). [5]

Emerging Challenges to Leadership: Leadership in changing workplace, Leader's role in fostering teamwork, Methods to enhance creative problem solving, Leadership practices for innovation, Ethical leadership development, Cultural sensitivity, Global leadership skills. [5]

Outcome Students will describe the various levels of management and applicability of management Principles, demonstrate various types of authority, delegation and decentralization in authority, demonstrate various types of leadership styles and identify the motivation techniques used by leaders, and discuss the impact of emerging issues in management.

Text Books

1. L.M. Parasad, "Principles & practice of management", Sultan Chand & Sons, New Delhi, (Latest edition).
2. Stephen P. Robbins "Organizational Behavior" Pearson Education, New Delhi (Latest edition).

Reference Books

1. T.N. Chhabra, "Business Organization and Management", Sun India Publications. New Delhi.
2. P.C. Tulsian, and V. Pandey, "Business Organization & Management", Pearson Education, India.

Pragmatic English Communication

Total Lectures: 26
2-0-0-2

Objective: This course aims to develop and enhance the linguistic and communicative competence of the students. The students will be exposed to various forms of personal and professional communication. The self-learning tasks designed will facilitate to enhance effective communication skills.

Pre-requisite: Basic knowledge of English grammar.

1. **Sentence Structure:** Elements of a sentence (Subject, verb, object, complement and adjunct) [7]
Correct Usage of Language: Tenses (Present, Past and Future, Modals (can, could, will, would, shall, should, may, might, must, ought to, need).
2. **Listening and Reading Skills:** Developing effective listening and reading. [6]
Writing Skills: Theme (Paragraph) writing, Letter (formal letters) and application writing, report writing, résumé writing
3. **Idioms and Phrasal Verbs:** Understanding idioms, collocations, introduction to phrasal [5]
4. **Common Errors:** How to avoid common sentence – structural errors, vocabulary and pronunciation [3]
5. **Technology-based Communication:** Effective e-mail messages; power-point presentation; enhancing editing skills using computer software. [5]

Outcome: The students will learn the essentials of English Grammar, analyze, identify and rectify the common errors in speech and writing. Student can read and write with ease and fluently, enrich vocabulary and enjoy reading and writing.

Text Books:

1. Wren & Martin: English Grammar & Composition, S. Chand & Co, Delhi (Latest edition)
2. Raman, M., & Singh, P. (2017). Business Communication (2nd edition.). New Delhi: Oxford University Press.

Reference Books:

1. Prasad, H. M. How to Prepare for Group Discussion and Interview. New Delhi: Tata McGraw-Hill Publishing Company Limited
2. Bonet, Diana. The Business of Listening: Third Edition. New Delhi: Viva Books, 2004.
3. Hornby A.S.: A Guide to patterns and usage, Oxford University Press, Delhi, 1954.
4. Lesikar, Raymond V and Marie E. Flatley. Basic Business Communication: Skills for Empowering the Internet Generation: Ninth Edition. New Delhi: Tata McGraw-Hill