(Batch 2019-2023,2020-2024,2021-2025)

CHOICE BASED CREDIT SYSTEM
EVALUATION SCHEME
AND
COURSE OF STUDY
IN

B.TECH.

COMPUTER SCIENCE AND ENGINEERING

SCHEME OF EXAMINATION & SYLLABUS

FACULTY OF ENGINEERING AND TECHNOLOGY

GURUKULA KANGRI UNIVERSITY, HARIDWAR

ACADEMIC SESSION 2019-20

B.Tech. I Year
Semester - I

DSC/ SEC/ AECC	Subject	Periods			Evaluation Scheme				Total Marks	Credits
					Continuous Internal Assessment		CIA Total	ESE		
		L	T	P	CT	TA				
THEORY										
BAC-C102/ BAC-C202	Engineering Chemistry	3	1	0	20	10	30	70	100	4
BEM-C102	Engineering Mathematics– I	3	1	0	20	10	30	70	100	4
BCE-C102/ BCE-C202	Programming for Problem Solving	3	1	0	20	10	30	70	100	4
BME-C103	Basic Mechanical Engineering	3	1	0	20	10	30	70	100	4
BEN-A103	Environmental Studies	2	0	0	20	10	30	70	100	0
	Induction Program	**Only for first 3 weeks**								
PRACTICAL										
BAC-C151/ BAC-C251	Engineering Chemistry Lab	0	0	2	10	5	15	35	50	1
BCE-C151 BCE-C251	Programming for Problem Solving Lab	0	0	2	10	5	15	35	50	1
BME-C153/ BME-C253	Engineering Graphics and Design Lab	0	0	2	10	5	15	35	50	2
BEG-A151/ BEG-A251	Technical Communication	0	0	2	10	5	15	35	50	1
	TOTAL	14	4	8	140	70	210	490	700	21

Coding:

BCE : Computers BET : Electronics BEM : Mathematics
BEE : Electricals BHU : Humanities BME : Mechanical
BAC : Chemistry BAP : Physics BEN : Environment
C : Discipline Specific Course A : Ability Enhancement Compulsory Course S : Skill Enhancement Course
E : Discipline ElectiveCourse G : Generic Elective ESE : End Semester Examination

BCE-C 101
- Semester
- 0, 5 & 6 stands for Theory, Practical & Seminar / Project respectively
- Paper Code

L- LECTURE; T- TUTORIAL; P- PRACTICAL; CT-CUMULATIVE TEST; TA- TEACHER ASSESSMENT; ESE–ENDSEMESTER EXAMINATION



B. Tech. I Year
Semester - II

Subject code	Subject	Periods			Evaluation Scheme				Total marks	Credit
					Continuous Internal Assessment		CIA Total	ESE		
		L	T	P	CT	TA				
THEORY										
BAP-C202	Engineering Physics	3	1	0	20	10	30	70	100	4
BEM-C202	Engineering Mathematics–II	3	1	0	20	10	30	70	100	4
BEE-C202	Basic Electrical Engineering	3	1	0	20	10	30	70	100	4
BET-C202	Electronic Devices	3	1	0	20	10	30	70	100	4
BHU-S202	Vedic Science & Engineering	2	0	0	20	10	30	70	100	0
	Summer Training and Internship	A training or internship is to be pursued after II sem, and the credits will be given in III sem after submitting the training certificate followed by presentation								
PRACTICAL										
BAP-C251	Engineering Physics Lab	0	0	2	10	5	15	35	50	1
BEE-C251	Basic Electrical Engineering Lab	0	0	2	10	5	15	35	50	1
BET-C251	Electronic Devices Lab	0	0	2	10	5	15	35	50	1
BME-C152/ BME-C252	Workshop Practice	0	0	2	10	5	15	35	50	1
BSP-S251	Physical Training & Yoga	0	0	2	0	0	50	0	50	0
	TOTAL	14	5	10	140	70	260	490	750	20

Coding

BCE : Computers BET : Electronics BEM : Mathematics
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BCE-C 101
- Semester
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Induction Program

Induction program **(mandatory)**	**3 weeks duration**
Induction program for students to be offered right at the start of the first year.	· Physical activity · Creative Arts · Universal Human Values · Literary · Proficiency Modules · Lectures by Eminent People · Visits to local Areas · Familiarization to Dept./Branch & Innovations



B.Tech. II Year
Semester - III

DSC/ SEC/ AECC	Subject	Periods			Evaluation Scheme				Total Marks	Credits
					Continuous Internal Assessment		CIA Total	ESE		
		L	T	P	CT	TA				
THEORY										
BEM-C302	Engineering Mathematics– III	3	1	0	20	10	30	70	100	4
BET-C306	Digital System Design	3	0	0	20	10	30	70	100	3
BCE-C307	Python Programming	3	0	0	20	10	30	70	100	3
BCE-C305/ BCE-C405	Data Structure-I	3	0	0	20	10	30	70	100	3
BCE-C306	Computer Architecture & Organization	3	0	0	20	10	30	70	100	3
PRACTICAL										
BCE-C355	Digital System Design Lab	0	0	2	10	5	15	35	50	1
BCE-C354	Python Programming lab	0	0	2	10	5	15	35	50	1
BCE-C355/ BCE-C454	Data Structure-I Lab	0	0	2	10	5	15	35	50	1
BCE-C356	Presentation	0	0	2	10	5	15	35	50	1
	TOTAL	15	1	8	140	70	210	490	700	20

Coding:

BCE	: Computers	BET	: Electronics	BEM	: Mathematics
BEE	: Electricals	BHU	: Humanities	BME	: Mechanical
BAC	: Chemistry	BAP	: Physics	BEN	: Environment
C	: Discipline Specific Course	A	: Ability Enhancement Compulsory Course	S	: Skill Enhancement Course

E : Discipline ElectiveCourse G : Generic Elective ESE : End Semester Examination

BCE-C 101
- 1 → Semester
- 0, 5 & 6 stands for Theory, Practical & Seminar / Project respectively
- 101 → Paper Code

L- LECTURE; T- TUTORIAL; P- PRACTICAL; CT-CUMULATIVE TEST; TA- TEACHER ASSESSMENT; ESE–ENDSEMESTER EXAMINATION



B. Tech. II Year
Semester - IV

Subject code	Subject	Periods			Evaluation Scheme				Total marks	Credit
					Continuous Internal Assessment		CIA Total	ESE		
		L	T	P	CT	TA				
THEORY										
BEM-C403	Discrete Mathematics	3	1	0	20	10	30	70	100	4
BCE-C408	Database Management System	3	0	0	20	10	30	70	100	3
BCE-C406	Object Oriented Programming using Java	3	0	0	20	10	30	70	100	3
BCE-C407	Operating System	3	0	0	20	10	30	70	100	3
BET-C411	Microprocessor and Interfacing	3	0	0	20	10	30	70	100	3
BKT-A403	Bhartiya Gyan Parampara (IKT)	2	0	0	20	10	30	70	100	0
	Summer training and Internship	**To be pursued during summer vacations, certificate of completion to be submitted in the department**								
PRACTICAL										
BCE-C455	DBMS Lab	0	0	2	10	5	15	35	50	1
BCE-C456	Object Oriented Programming using Java Lab	0	0	2	10	5	15	35	50	1
BET-C461	Microprocessor and Interfacing Lab	0	0	2	10	5	15	35	50	1
BCE-A460	MOOC (Soft Skills)	0	0	2	10	5	15	35	50	1
	TOTAL	17	1	8	160	80	240	560	800	20

Coding

BCE	: Computers	BET	: Electronics	BEM	: Mathematics
BEE	: Electricals	BHU	: Humanities	BME	: Mechanical
BAC	: Chemistry	BAP	: Physics	BEN	: Environment
C	: Discipline Specific Course	A	: Ability Enhancement Compulsory Course	S	: Skill Enhancement Course

E : Discipline ElectiveCourse G : Generic Elective ESE : End Semester Examination

BCE-C 101
- 1 → Semester
- 0, 5 & 6 stands for Theory, Practical & Seminar / Project respectively
- 101 → Paper Code

L- LECTURE; T- TUTORIAL; P- PRACTICAL; CT-CUMULATIVE TEST; TA- TEACHER ASSESSMENT; ESE–ENDSEMESTER EXAMINATION

GURUKULA KANGRI (DEEMED TO BE UNIVERSITY), HARIDWAR
Faculty of Engineering & Technology
Computer Science & Engineering
B. Tech. Third Year
Syllabus in accordance with AICTE Model Curriculum

SEMESTER-V

DSC/SEC/DSE/ AEC	SUBJECT	PERIODS			EVALUATION SCHEME				Subject Total	Credits
					SESSIONAL EVALUATION			EXAM		
		L	T	P	CT	TA	Total	ESE		
THEORY										
BCE-C511	Computer Network	3	1	0	20	10	30	70	100	4
BCE-C512	Advance Data Structure	3	1	0	20	10	30	70	100	4
BCE-C513	Design & Analysis of Algorithm	3	1	0	20	10	30	70	100	4
BCE-C514	Cloud Computing	3	1	0	20	10	30	70	100	4
BCE-M001	Universal Human Values	3	0	0	20	10	30	70	100	0
BCE-P5XX	Program Elective – I	3	0	0	20	10	30	70	100	3
BCE-O5XX	Open Elective – I	3	0	0	20	10	30	70	100	3
PRACTICAL										
BCE-C561	Advance Data Structure Lab	0	0	2	10	5	15	35	50	1
BCE-C562	Cloud Computing Lab	0	0	2	10	5	15	35	50	1
BCE-S570	Summer Training and Internship Program-II Presentation*	0	0	2	10	5	15	35	50	1
TOTAL		21	4	6	170	85	255	595	850	25

***For the Summer Training and Internship program done in summer break after IV semester examination, A certificate of completion to be submitted along with the presentation in the department. In case a student is unable to do an internship in some company, he may do any one extra online skill enhancement course.



Program Elective - I

BCE-P515	**Object Oriented Programming Using CPP**
BCE-P516	**Computer Graphics**
BCE-P517	**Machine Learning – I**
BCE-P518	**Software Engineering**
BCE-P519	**Data Analytics -1**
BCE-P520	**Complexity Theory**

Open Elective Subject List -1

BCE-O530	**Advance Operating System**
BCE-O531	**Functional Programming Principles with Scala**
BET-O532	**Signals and Systems**
BCE-O533	**Business Economics and Financial Analysis**
BCE-O534	**Introduction to AI**
BCE-0535	**Linux and Shell Programming**



GURUKULA KANGRI (DEEMED TO BE UNIVERSITY), HARIDWAR
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B. Tech. Third Year
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SEMESTER-VI

DSC/SEC/DSE/ AEC	SUBJECT	PERIODS			EVALUATION SCHEME				Subject Total	Credits
					SESSIONAL EVALUATION			EXAM		
		L	T	P	CT	TA	Total	ESE		
THEORY										
BCE-C611	Distributed Systems	3	1	0	20	10	30	70	100	4
BCE-C612	Formal Languages and Automata Theory	3	1	0	20	10	30	70	100	4
BET-C610	Embedded Systems	3	1	0	20	10	30	70	100	4
BCE-M002	Intellectual Property Rights	3	0	0	20	10	30	70	100	3
BCE-P6XX	Program Elective – II	3	0	0	20	10	30	70	100	3
BCE-O6XX	Open Elective-II	3	0	0	20	10	30	70	100	3
PRACTICAL										
BCE-C661	Distributed Systems Lab	0	0	2	10	5	15	35	50	1
BET-C661	Embedded Systems Lab	0	0	2	10	5	15	35	50	1
BCE-P663	Project	0	0	2	10	5	15	35	50	1
BCE-S670	Seminar on Latest Technologies	0	0	2	10	5	15	35	50	1
TOTAL		18	3	8	160	80	240	560	800	25



Program Elective Subject List- II

BCE-P614	**Machine Learning - 2**
BCE-P615	**Advance Database Management System**
BCE-P616	**Software Project Management**
BET-P617	**Digital Signal Processing**
BCE-P618	**High Performance Computer Architecture**
BCE-P619	**Full Stack Web Development**
BCE-P620	**Data Analytics -2**
BCE-P621	**Cyber Forensics**
BCE-P622	**Augmented Reality and Virtual Reality**

Open Elective –II

BCE-O630	**Applied AI**
BET-O631	**Digital Image Processing**
BCE-O632	**Industrial Economics and Business Administration**
BCE-O633	**Introduction to Data Science and Design Thinking**
BCE-O634	**Data Mining**
BCE-O635	**Natural Language Processing**
BCE-O636	**E-commerce & Social Media Analysis**
BCE-O637	**Java Programming and Introduction to Python****
BCE-O657	**Java Programming and Introduction to Python Lab****



GURUKULA KANGRI (Deemed to be University), HARIDWAR
Faculty of Engineering & Technology
Computer Science & Engineering

B. Tech. Fourth Year
Syllabus in accordance with AICTE Model Curriculum

SEMESTER-VII

DSC/SEC/DSE/ AEC	SUBJECT	PERIODS			EVALUATION SCHEME				Subject Total	Credits
					SESSIONAL EVALUATION			EXAM ESE		
		L	T	P	CT	TA	Total			
THEORY										
BCE-C711	Compiler Design	3	1	0	20	10	30	70	100	4
BCE-C712	Linux System Administration	3	1	0	20	10	30	70	100	4
BCE-P7XX	Program Elective –III	3	0	0	20	10	30	70	100	3
BCE-O7XX	Open Elective –III /	3	0	0	20	10	30	70	100	3
PRACTICAL										
BCE-C762	Linux System Administration Lab	0	0	2	10	5	15	35	50	1
BCE-P770	Minor Project with research paper	0	0	8	20	10	30	70	100	6
TOTAL		12	2	10	110	55	165	385	550	21



Program Elective Subject List - III

BCE-P713	Wireless Networks
BCE-P714	Information and Network Security
BCE-P716	Human Computer Interaction
BCE-P717	Block Chain
BCE-P718	Deep Learning
BCE-P719	Fuzzy logic and Neural Networks
BCE-P720	Real Time Operating System
BET-P721	Internet of Things

Open Elective –III

BCE-O731	Optimization Techniques in Computing
BCE-O732	Parallel and Distributed System
BCE-O733	Adhoc and Sensor Networks
BET-O734	BioMedical Signal Processing
BCE-O735	Ecommerce
BCE-O736	Human Resource and Organization Behaviour
BCE-O737	Soft Computing
BCE-O738	Storage Management
BCE-O739	Quantum Computing
BCE-O740	Computer Vision
BCE-O741	AI in Healthcare
BCE-O742	Neural Networks and Deep Learning



GURUKULA KANGRI VISHWAVIDYALAYA (Deemed to be University), HARIDWAR
Faculty of Engineering & Technology
Computer Science & Engineering

B. Tech. Fourth Year
Syllabus in accordance with AICTE Model Curriculum

SEMESTER-VIII

DSC/SEC/DSE /AEC	SUBJECT	PERIODS			EVALUATION SCHEME				Subject Total	Credits
					SESSIONAL EVALUATION			EXAM ESE		
		L	T	P	CT	TA	TOTAL			
THEORY										
BCE-O8XX	MOOC- I	3	1	0	20	10	30	70	100	4
BCE-O8XX	MOOC- II	3	1	0	20	10	30	70	100	4
BCE-O8XX	MOOC- III	3	1	0	20	10	30	70	100	4
PRACTICAL										
BCE-P861	Major Project with Research paper	0	0	16	0	100	100	300	400	6+3
TOTAL		09	3	16	60	130	190	510	700	21

List of MOOC courses shall be decided by the departmental committee in each semester depending upon the list from SWAYAM/NPTEL and other recognized online platforms. Students have to study from Online Platform doubt sessions shall be held by Internal teachers and exams shall be taken by university. If a student wishes he can give exam of Online Platform for certification. SWAYAM courses to run every year from July onwards (Odd Semester) are declared in the month of May and for courses to run every year from January onwards(Even Semester) are declared in the month of December on website https://swayam.gov.in/.



BAC-C102/BAC-C202
ENGINEERING CHEMISTRY

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT –I

Periodic properties (8 hours)

Effective nuclear charge, Penetration of orbitals, Variations of s, p, d and f orbital energies of atoms in the periodic table, Atomic and Ionic sizes, Ionization energies, Electron affinity and Electronegativity, Polarizability, Oxidation states, Coordination numbers and Geometries, Hydrogen bonding, Concept of hybridization.

UNIT -II

Chemical kinetics & Use of free energy in chemical equilibria (8 hours)

Introduction, Rate of reaction, Factors influencing rate of reaction, Order and Molecularity of reaction, Arrhenius equation, Concept of activation energy and its determination, Collision theory of reaction rates.

Thermodynamic functions: Energy, Entropy and Free energy, Estimations of entropy and Free energies, Free energy and emf. Cell potentials, the Nernst equation and applications (without derivation) Acid-base equilibria.

UNIT -III

Polymers (8 hours)

Polymers, Nomenclature of polymers, Types of polymerization, Classification of polymerization, Industrial application of polymers, Conducting polymers.

(i) Plastics: Structure, Properties and uses of thermoplastic (Polyvinyl chloride, Teflon, Nylons and Polymethyl methacrylate) & Thermosetting (Bakelite) materials, Uses of plastics.

(ii) Rubber: Natural rubber & Synthetic rubber, Vulcanization of rubber, Advantages of vulcanization of rubber.

UNIT -IV

Nano chemistry (8 hours)

Introduction, Nanotechnology applications, Role of bottom-up & Top-down approaches in Nanotechnology, Material self-assembly, Self-assembling materials, Nanomaterials, Nanocrystals/Nanoparticles, Properties and applications of Nanoparticles, Carbon Nano tube (Basic concept Only).

UNIT -V

Organic reactions and synthesis of a drug molecule (8 hours)

Introduction to reactions involving Substitution, Addition, Elimination, Oxidation, Reduction, Basic concept of stereoisomerism (Geometrical & Optical isomerism).

Synthesis of a commonly used drug molecule (Definitions of different classes of drugs, Synthesis of Aspirin, Phenacetin & Paracetamol Only, Excluding mechanism).



Suggested Text Books

- **(i)** University chemistry, by B. H. Mahan
- **(ii)** Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
- **(iii)** Fundamentals of Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
- **(iv)** Physical Chemistry, by P. W. Atkins
- **(v)** Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp
- **(vi)** Principles of Physical Chemistry, by B.R. Puri, L.R. Sharma, M. Pathania
- **(vii)** A text book of Organic Chemistry, by S. K. Jain
- **(viii)** A text book of Engineering Chemistry, by S. S. Dara
- **(ix)** A text book of Engineering Chemistry, by Jain & Jain

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

The course will enable the student to:

- Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- Rationalize bulk properties and processes using thermodynamic considerations and learn about chemical kinetics.
- Know about the polymers, polymerization, synthesis and uses of different polymers, plastics and rubbers.
- Know about the Nano chemistry, nanoparticles, Nano materials, and their properties and applications.
- List major chemical reactions that are used in the synthesis of molecules.



BEM-C102
ENGINEERING MATHEMATICS -I

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credits 4**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Differential Calculus I: Successive differentiation, Leibnitz theorem, Taylor's & Maclaurin's Expansion, Indeterminate forms, Radius of curvature, Asymptotes, Double points and their classification, Tracing of curves.

UNIT II

Differential Calculus II: Partial Differentiation of functions, Normal to surfaces and tangent plane, Change of variables, Jacobian, Taylor's series of two variables, Truncation errors, Extrema of function of two and more variables, Method of Lagrange's multipliers.

UNIT III

Multiple Integrals: Fundamental Theorem of integral calculus, Differentiation under the integral sign, Double and triple integrals, change of order of integration, change of variables. Application to arc length, area, volume, centroid and moment of inertia. Gamma and Beta functions, Dirichlet's integral.

UNIT IV

Vector Calculus: Differentiation of a vector, Scalar and vector fields, Gradient, Divergence, Curl and their physical meanings, Differential operator and identities, Line, Surface and Volume integrals, green's theorem in plane. Gauss and Stoke's theorems (without proof). Simple applications.

UNIT V

Matrices: Elementary row/ column operations, Rank of a matrix and its applications, Eigen-values and Eign vectors, Cayley-Hamilton theorem, Diagonalization of Matrices, Linear dependence and independence, Normal matrices, Complex matrices and unitary matrices.

Text Books / References

1. Prasad C., A first course in mathematics for Engineers, Prasad Mudranalaya
2. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999
3. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000
4. Srivastava R.S.L., Engineering Mathematics Vol.I



BCE-C102/ BCE-C202

PROGRAMMING FOR PROBLEM SOLVING

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Computers: Block diagram of computers, functions of its important components, Memory and I/O devices. Concept of assembler, interpreter, compiler & generation of languages.
Number System: Decimal, Binary, Octal, and Hexadecimal numbers and their arithmetic (addition, subtraction, multiplication, and division): 1's and 2's complements

UNIT II

Programming in C: History, Introduction to C Programming Languages, Structure of C Programs, Compilation and Execution of C Programs, debugging techniques, Data Type and sizes, Declarations of variables, Modifiers, Identifiers and keywords, Symbolic Constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.
Operators: Unary operators, Arithmetic & Logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.
Control Statements: If-else, switch, break, continue, the coma operator, go to statement.
Loops: while, do-while, for loop.

UNIT III

Arrays: One-dimensional arrays: declaration, initialization and application. Two-dimensional array: declaration, initialization and application, Multidimensional arrays.
Handling of Character Strings: Declaring and initializing string variables, reading strings, Writing strings, Arithmetic operation on strings, comparison of two strings and string handling functions.
Pointers: Accessing the address of the variable, Declaring and initializing pointers, accessing a variable through its pointer expression, pointer increment and scale factor, pointers and array, pointers and character strings.

UNIT IV

Functions: Need for user defined function, return value and its type, function calls, no argument and No return values function, Argument and No return values functions, argument and return value functions. Handling of non-integer function, Scope and life time of variable in functions.
Recursion: Recursive Definition and processes, recursion in C, example of recursion, Tower oh Hanoi Problem, simulating recursion, Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

UNIT V

Structures: Structures definition, giving value to members, structure initialization, array of structures, array within structures, structures within structures, structures and functions, Structure Pointers.
File Handling: Creating and Deleting a File, Updating File, Copying File, Searching & Sorting in a File.



Text Books / References

1. Rajaraman V.(3/e), Fundamental of Computers, PHI, New Delhi, 1999
2. Sanders,D.H., Computers Today, Mcgraw Hill, 1998
3. Kris Jamsa, DOS the complete reference, Tata McGraw Hill
4. J.Peek Tim O'reilly & M.Locekides, UNIX POWER TOOLS, BPB Publication
5. Yashwant Kanetkar, Let Us C, BPB
6. Yashwant Kanetkar, C In Depth, BPB



Revised Syllabus (**Effective from the session 2019-20**)
Gurukula Kangri Vishwavidyalaya, Haridwar
Faculty of Engineering & Technology
Computer Science & Engineering

BME-C103
BASIC MECHANICAL ENGINEERING

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Thermodynamics I: Introduction to SI units, Definition of thermodynamic system, Surrounding and Universe, Quasi static process, Energy interaction Zeroth law, Concept of temperature First law of thermodynamics, Application to closed and open system, Concept of Enthalpy, steady flow energy equation, Throttling process.

UNIT II

Thermodynamics II: Second law, reversible and irreversible process, Thermal reservoir, heat engines and thermal efficiency, COP of heat pump and refrigerator, Carnot cycle, Claudius inequality, Concept of entropy, Entropy change for ideal gases**.**

UNIT III

Thermodynamics III: Generation of steam at constant pressure, Properties of steam, Use of property diagram, Process of vapor in closed and open system, Rankine cycle. Stroke clearance ratio, Compression ratio, Definition and calculation of mean effective pressure (no proof) for air standard cycles (Otto and diesel cycles

UNIT IV

Mechanics: Trusses: Plane structure, (Method of Joints and Sections only) Beams: Bending moment and shear force diagram for statically determinate beams.

UNIT V

Strength of Materials: Simple stresses and strain, strain energy, stress- strain diagram, elastic constants. Compound stress and strain: state of stress at a point, Simple tension, pure shear, general two-dimensional stress system, principal planes, principal stresses and strains, Mohr's stress circle, Poisson's ratio, maximum shear stress

Text Books / References

1 Kumar DS (2/e), Thermal Science and Engineering, S.K.Kataria, New Delhi,2001
2 P.K.Nag (2/e), Engineering Thermodynamics, TMH, New Delhi,2001
3 R.Yadav(7/e), Thermal Engineering, Central Publishing House, Allahabad, 2000
4 Shames Irving H.(4/e), Engineering Mechanics, PHI, New Delhi, 1994
5 Hibler (1/e), Statics and Dynamics, Pearson Education, Singapore, 2000



BEN-A103

ENVIRONMENTAL STUDIES

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 0**
2 0 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

The Multidisciplinary Nature of Environmental Studies & Ecosystems: (a) Definition, scope and importance of ecology and environment (b) The ecological components: (i) Abiotic components: soil, water, light, humidity and temperature (ii) Biotic components & their relationships- symbiosis, commensalisms, parasitism, predation and antibiosis (c) Concept of an ecosystem (d) Structure and function of an ecosystem (e) Producers, consumers and decomposers (f) Energy flow in the ecosystem (g) Ecological succession (h) Food chains, food webs and ecological pyramids (i) Introduction, types, characteristic features, structure and function of the following ecosystems: (i) Forest ecosystem (ii) Grassland ecosystem (iii) Desert ecosystem (iv) Aquatic ecosystems (pond, river, ocean estuaries, streams, lakes) (j) Need for public awareness

UNIT II

Natural Resources: (a) Renewable and Non-Renewable resources (b) Natural resources and associated problems: (i) Forest resources: use and over-exploitation, deforestation case, timber extraction, mining, dams and their effects on forest and tribal people (ii) Water resources: use and over-utilization of surface and ground floods, drought, conflicts over water, dams benefits and problem (iii) Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, case studies (iv) Food resources : world food problems, changes caused by agriculture overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies (v) Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies (vi) Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification (vii) Biodiversity & its conservation: definition- genetic, species and ecosystem diversity, values of biodiversity- consumptive use, productive use, social, ethical, aesthetic and option values (viii) Biodiversity at global, national and local levels, India as a mega-diversity nation, hot-spots of biodiversity, threats to biodiversity- habitat loss, poaching of wildlife, man-wildlife conflicts; endangered and endemic species of India, conservation of biodiversity: *in-situ* & *ex-situ* conservation of biodiversity (ix) Bio-geographical classification of India (x) Role of an individual in conservation of natural resources (xi) Equitable use of resources for sustainable lifestyles.

UNIT III

Environmental Pollution: (a) Definition, causes, effects and control measures of: air pollution, water pollution, soil pollution, noise pollution, thermal pollution and nuclear hazards (b) Solid waste management- causes, effects and control measures of urban and industrial wastes (c) Role of an individual in prevention of pollution (d) Pollution case studies (e) Disaster management: floods, earthquake, cyclone & landslides

UNIT IV

Social Issues and the Environment: (a) From unsustainable to sustainable development (b) Urban problems related to energy (c) Water conservation, rain water conservation, rain water harvesting, management (d) Resettlement & rehabilitation of people- its problems and concerns, case studies (e) Environmental ethics- issues and possible solutions (f) Wasteland reclamation (g) Consumerism and waste products (h) Population growth, variation among nations, family welfare program (i) Environment and human health, human rights, value education (j) HIV/AIDS (k) Role of information technology (IT) in environment and human health (l) Case studies.

UNIT V

Environmental policies and laws: Salient features of following acts (a) Environment Protection Act 1986 (b) Air (Prevention and Control of Pollution) Act 1981 (c) Water (Prevention and Control of Pollution) Act 1974 (d) Wildlife Protection Act 1972 (e) Forest Conservation Act 1980 (f) Issues involved in enforcement of environmental legislation (g) Public awareness

Suggested Books

1. Asthana, D. K. (2006). Text Book of Environmental Studies. S. Chand Publishing.
2. Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
3. Basu, R. N., (Ed.) (2000). Environment. University of Calcutta, Kolkata
4. Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
5. De, A.K., (2006).Environmental Chemistry, 6th Edition, New Age International, New Delhi.



Gurukula Kangri Vishwavidyalaya, Haridwar
Faculty of Engineering & Technology
Computer Science & Engineering

BAC-C151/BAC-C251
ENGINEERING CHEMISTRY LAB

MM: 50 **Sessional: 15**

Time: 2 hrs **ESE: 35**

L T P **Credits 1**

0 0 2

LIST OF EXPERIMENTS

Choice of 10-12 experiments from the following:

1. Chemical analysis of a salt (mixture of one acidic radical and one basic radical).
2. Determination of relative surface tension of given liquid by Satalagmometer.
3. Determination of relative viscosity of given liquid by Ostwald's viscometer.
4. Separation of given binary mixture by thin layer chromatography.
5. Separation of given binary mixture by ascending paper chromatography.
6. Titration of a strong acid with a strong base.
7. Titration between potassium permanganate and ferrous ammonium sulphate solution.
8. Titration between potassium permanganate and oxalic acid solution.
9. Determination of turbidity of unknown sample by using turbiditimeter.
10. Determination of cell constant and conductance of solutions.
11. Determination of the pH of unknown solutions by pH meter.
12. Determination of redox potentials and emfs.
13. Determination of refractive index of unknown sample by using Abbe's refractometer.
14. Determination of chloride content in a water sample by Mohr's method.
15. Determination of molar mass of an unknown solid using the colligative property of freezing point depression.
16. Determination of the partition coefficient of a substance between two immiscible liquids.
17. Determination of moisture content present in hydrated copper sulphate.
18. Determination of saponification value of an oil.
19. Determination of acid value of an oil.

Laboratory Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, pH, turbidity, refractive index, chloride content of water, etc.
Estimate concentration of an unknown sample via acid-base and oxidation – reduction titrations.
Synthesize a small drug molecule and analyze a salt sample.
Identify the acid base radicals.
Separate the components present in a mixture by TLC and ascending paper chromatography.

Suggested Books

(i) Advanced practical physical chemistry, by J. B. Yadav
(ii) Analytical chemistry Vol. I, II, III, by Subhash, Satish
(iii) Applied chemistry, by Virmani and Narula

NOTE

1. In practical examination, the student shall be required to perform one experiment which carries 40 marks and 30 marks shall be reserved for practical record and viva-voce examination.
2. The number of students in a batch allotted to an examiner for practical examination shall not exceed 30 students.

BCE-C151/ BCE-C251
PROGRAMMING FOR PROBLEM SOLVING LAB

MM: 50 **Sessional: 15**

Time: 2 hrs **ESE: 35**

L T P **Credits 1**

0 0 2

LIST OF EXPERIMENTS

1. Conversion from one number system to another
2. Perform different arithmetic operations.
3. Greater of two numbers using logical operators
4. Check whether no. Is odd or even using arithmetic operators
5. Check whether no. Is prime or not.
6. Print Fibonacci series.
7. Print factorial of a no. Using recursion
8. Add two matrices.
9. Search a no. In array.
10. Reverse an array.
11. Find a leap year.
12. Multiply two matrices.
13. Pass by reference in functions
14. Find factorial of a number.
15. Create a menu function for all arithmetic operations using one program
16. Addition subtraction using call by functions.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D.

BME-C153/BME-C253
ENGINEERING GRAPHICS AND DESIGN LAB

MM: 50 **Sessional: 15**
Time: 2 hrs **ESE: 35**
L T P **Credits 2**
0 0 2

Unit 1: Introduction to Engineering Drawing
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering and dimensioning, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, and Hypocycloid Scales – Plain, Diagonal and Vernier Scales;

Unit 2: Orthographic Projections and Projections of Regular solids
Principles of Orthographic Projections-Conventions – Principal planes, Auxiliary Planes, Introduction to first angle and third angle projection, Projections of Points, projection of lines- parallel to both the planes, parallel to one and inclined to other, inclined to both the planes, true length and traces of a line, and lines inclined to both planes, Projections of planes, traces of planes, angles of inclinations of planes, parallel planes.

Unit 3: Sections and Sectional Views of Right Angular Solids and Isometric Projections
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Unit 4: Overview of Computer Graphics Customization and CAD Drawing
Computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software (AUTOCAD) [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in AUTOCAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

Unit 5: AUTOCAD as a tool for design and drawing objects

Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); orthographic projection techniques; Drawing sectional views of composite right regular geometric solids CAD software (AUTOCAD) modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling. Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Appling Color coding according to building drawing practices; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).



Text Books / References

i. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
ii. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
iii. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication (iv) Narayana, K.L. & Pannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BEG-A151/BEG-A251
TECHNICAL COMMUNICATION

MM: 50 **Sessional: 15**
Time: 2 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

Objective:

1. To expose the learners to English sound system and acquire phonetics skill and speech rhythm
2. To help the learners use grammar correctly
3. To train the learners to speak English, clearly, intelligently and effectively
4. To equip the learners to compete for a career, and enable them to function effectively in careers which demand good communicative skills
5. To impart moral values

Contents:

1. Nonverbal communication
   - Use of hands
   - Posture of shoulders
   - Eye contact
   - Weight of the body
   - Movement of the body

2. Applied phonetics
   - Sound of English – consonants and vowels
   - Phonemic transcription
   - Stress, Rhythm and intonation

3. Remedial grammar
   - Some useful expression (introduction, greetings etc.) that are used frequently
   - Common mistakes in the use of nouns, pronouns, adjectives, adverbs, prepositions, conjunctions
   - Use of the who and whom, much and many, still and yet, so as and so that, make and do
   - Tense and their use
   - Confusion of participles
   - Tag questions

4. Reading and speaking skills, listening and speaking skills
   - Presentation and addresses
   - Group discussions
   - Interviews
   - Role playing

5. Reading and writing skill, listening and writing skills
   - Letter writing – formal and informal
   - Real life social situations
   - Curriculum vitae
   - Agenda, notice and minutes

6. Case studies

- Study of renowned speeches of famous personalities
    - Swami Vivekananda
    - Mahatma Gandhi
    - Jawaharlal Nehru
    - Swami Shraddhanand
    - Steve Jobs

Text Books / References

1) Balasubramaniam, T. *Phonetics for Indian Students*. Macmillan India Ltd.
2) Daniel, Jones. English Pronouncing Dictionary. Cambridge University Press.
3) Oxford Advanced Learners' Dictionary.
4) Taylor, Grant "conversation practice", Tata Mc Graw Hills, new Delhi
5) F.T.A. Wood, "Remedial English Grammar", macmillan India Ltd.
6) Berry, Thomas Elliot, "The Most Common Errors in English Usage" Tata Mc Graw Hills, New Delhi
7) Krishnaswamy, N. "*Modern English*. Macmillan India Ltd.
8) Desmond, "people watching"



BAP-C202
ENGINEERING PHYSICS

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT –I

Wave & Oscillations: Simple harmonic motion, damped and forced simple harmonic oscillator, Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

UNIT –II

Quantum Mechanics: Introduction to quantum physics, black body radiation, explanation using the photon concept, photoelectric effect, Compton effect, de Broglie hypothesis, wave-particle duality, Born's interpretation of the wave function, verification of matter waves, uncertainty principle, Schrodinger wave equation & its solution for particle in box

UNIT –III

Electrostatics : Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images with simple examples , energy of a charge distribution and its expression in terms of electric field.

UNIT –IV

Magnetostatics & LASERS: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby laser, He-Ne and CO2 laser, properties and applications of lasers.

UNIT –V

Electronic materials: Free electron theory of metals, quantum theory of free electrons, Fermi level, Density of states, Energy bands in solids, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level,

Semiconductors: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), concentration of charge carriers, Carrier generation and recombination, Carrier transport: diffusion and drift in p-n junction.

Text Books / References

1.I.G. Main, Vibrations and Waves in Physics, Cambridge University Press (1993).

2. H. J. Pain, The Physics of Vibrations and waves, Wiley India Pvt., Ltd. 6th Edition (2010).

3. David Griffiths, Introduction to Electrodynamics, Pearson Education India Learning Private Ltd. 4th Edition (2015).

4. Halliday, Resnick, Walker, Fundamental of Physics, Wiley India Pvt. Ltd; 10th Edition (2015).

5.W. Saslow, Electricity, magnetism and light, Academic Press, 1th Edition (2002).

6. E. Hecht, Optics, Pearson Education, India, 4 th Edition (2008).

7. A. Ghatak, Optics, Tata McGraw-Hill Education India, 5 th Edition (2012).

8. O. Svelto, Principles of Lasers, Springer Science & Business Media (2010).

9. D.J. Griffiths, Quantum Mechanics, Pearson Education (2014).

10. R. Robinett, Quantum Mechanics, OUP Oxford (2006).

11. L.I. Schiff, Quantum Mechanics, Tata McGraw-Hill Education Pvt. Ltd, 4th Edition (2014)

12. D.A. Neamen, Semiconductor Physics and Devices, Times Mirror High Education Group, Chicago (1997).

13. E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore (1998).

14. B. G. Streetman, Solid State Electronic Devices, Prentice Hall of India (1995).

15. K. Charles, Introduction to Solid State Physics, John Wiley, Singapore, 7th Edition (1996).

BEM-C202
ENGINEERING MATHEMATICS II

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Differential Equations: Ordinary differential equations of first order, orthogonal trajectories, linear differential equations with constant coefficients, Simple applications, Euler- Cauchy equations, Equations of the form $y'' = f(y)$. Solution of second order differential equations by change of dependent and independent variables, Method of variation of parameters for second order differential equations.

UNIT II

Partial Differential Equations: Introduction of partial differential equations, solution of Linear partial differential equations of second order with constant coefficients and their classification, Method of separation of variables.

UNIT III

Solution in Series: Solution in series of second order linear differential equations, Bessel's and Legendre's equations and their solutions, Properties of Bessel function and Legendre's polynomials, Rodrigue's formula, Recurrence relations, Generating functions, Jacobi series, Integral representation of Bessel's functions.

UNIT IV

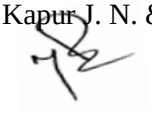
Fourier Series: Fourier series, Dirichlet's condition and convergence, Change of interval, Half range series, Harmonic analysis.

UNIT V

Statistics: Random variables, Probability mass function, Probability density function, Moments, Moment generating functions. Binomial, Poisson and Normal distributions. Correlation and Regression. Method of least squares and curve fitting - straight line and parabola.

Text Books / References

1. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999
2. Simmons, G.F., Differential Equations with Applications and Historical Notes, McGraw-Hill, 1991.
3. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000
4. Jain R. K., Iyenger S.R.K., Advanced Engineering Mathematics, Narosa , 2002.
5. Miller and Freunds, Probability and Statistics for Engineers, PHI, 2011.
6. Kapur J. N. & Saxena H.C., Mathematical Statistics, S Chand, 2010.



BEE-C202
BASIC ELECTRICAL ENGINEERING

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

D.C. Network Theory: Concept of elements**,** Circuit theory concepts- Mesh and node analysis, Star-Delta transformation. Network Theorems- Super-position theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, DC Transients- RL, RC circuits.

UNIT II

Steady State Analysis of A.C. Circuits: Sinusoidal and Phasor representation of voltage and current, average and rms value, form and peak factor of sinusoidal and different waveforms, single -phase A.C. circuit- behavior of resistance, inductance and capacitance and their combination in series & parallel and power factor, series parallel resonance-band width and quality factor.
Three Phase A.C. Circuits: Star-Delta connections, line and phase voltage/current relations, three -phase power and its measurement.

UNIT III

Magnetic Circuits: Ampere turns, magnetomotive force, permeability, reluctance, composite magnetic circuits, comparison between magnetic and electric circuits.
Transformer: Principle of operation, types of construction, phasor diagram, equivalent circuit, efficiency and voltage regulation of single-phase transformer, O.C. and S.C. tests.

UNIT IV

D. C. Machines: Principle of electromechanical energy conversion, types of D.C. machines, E.M.F. equation, Magnetization and load characteristics, losses and efficiency, speed control of D.C. motors and applications.
Measuring Instruments: Principle of working and constructional features of Permanent Magnet Moving Coil and Moving Iron ammeters and voltmeters, Electrodynamic Wattmeter, Induction type single-phase Energy meter.

UNIT V

Three-phase Induction Motor: Principle of operation, types and methods of starting, slip-torque characteristics and applications.
Single-phase Induction Motor: Principle of operation, methods of starting.
Three-phase Synchronous Machines: Principle of operation and application of synchronous motor.



Text Books

1. V. Del Toro, Principles of Electrical Engineering, Prentice Hall International.
2. H. Cotton, Advanced Electrical Technology, Wheeler Publishing.
3. E. Huges, Electrical Technology.

References

1. B. L., Theraja, Electrical Technology, Vol-1, S. Chand Publisher, New Delhi.
2. W.H. Hayt & J.E. Kennedy, Engineering circuit Analysis, Mc Graw Hill.
3. I.J. Nagrath, Basic Electrical Engineering, Tata Mc Graw Hill.
4. A.E. Fitgerald, D.E., Higginbotham and A Grabel, Basic Electrical Engineering, Mc Graw Hill.
5. Ashfaq Hussain, Fundamentals of Electrical Engineering, Dhanpat Rai Publish.

BET-C202
ELECTRONIC DEVICES

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Semiconductors, energy band description of semiconductors, effect of temperature on semiconductors, intrinsic and extrinsic semiconductors, donor and acceptor impurities, electron and hole concentration, conductivity of a semiconductor, mobility and resistivity, Generation and Recombination, Hall effect, Fermi level, mass action law, charge densities in a semiconductor, diffusion and Poisson and continuity equation.

UNIT II

P-N junction and its properties, V-I characteristics of P-N junction, semiconductor-diode, depletion layer, equivalent circuits of junction diode, diode equation, diode resistance and capacitance, application of junction diode as clippers, clampers and rectifiers (Half-wave, Full-wave and bridge), efficiency of rectifiers, ripple factor, filter circuits, Zener and avalanche breakdown mechanism, Zener diode and its characteristics, equivalent circuit of Zener diode, Zener diode as a voltage regulator, LED, photo diode and solar cell.

UNIT III

Bipolar junction transistor (BJT) and its action, Transistor configurations (CB, CE and CC) and their characteristics, cut-off, active and saturation regions. Transistor as a switch, operating point, dc load line, Transistor biasing and its necessity, thermal runaway, types of biasing and their analysis, stability factors, Transistor as a regulator. Concept of Transistor amplifier, graphical analysis of CE amplifier, dc and ac equivalent circuits, Emitter follower and its ac model.

UNIT IV

Ebers-Moll model of BJT, T model of BJT, Hybrid model of BJT at low frequency, computation of voltage gain, current gain and power gain, Zi and Zo and approximate formulas, high frequency transistor hybrid π model.

UNIT V

Field Effect Transistor: JFET and its characteristics, biasing of JFET, small signal low frequency and high frequency model of JFET amplifier, configurations of JFET, MOSFET, MESFET (Enhancement & depletion types) their construction and characteristics, configuration of MOSFET, MOS capacitor.

Text Book

1. Integrated Electronics: Jacob Millman & C.C. Halkias

References

1. Malvino and leach “Digital principle and applications.
2. Streetman Ben.G, “Solid state electronic devices” (3/e), PHI
3. Millman and grabel, “Microelectronics” PHI
4. Robert Bolyestad “Electronic devices and circuit”, PHI



BHU-S202
VEDIC SCIENCE & ENGINEERING

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 0**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Science in Vedic literature and Indian Philosophy-I: Kanad's atomic theory, concept of parmanu, Formation of molecules, Parimandal, Comparison with Dalton's atomic theory and models of Thompson, Rutherford and Bhor. Concept of SAMATA and VISHAMTA vs Maxwell-Boltzmann's distribution of velocities and energies.

UNIT II

Science in Vedic literature and Indian Philosophy-II: First and Second Law of thermodynamics in daily life. Law of helplessness of mankind in thermodynamics and Indian philosophy. Entopy in life and concept of pralaya. Dhananjay Vs concept of Radioactivity-life after death. Atomic spectrum Vs concept of Kundalini.

UNIT III

Vedic Mathematics: Measurements in Vedic Times, ancient scale of length, mass, time and temperature, Number system, Geometry according to sulba Sutra. Overview of Vedic Mathematical Rules (ekadhiken pooren, Nikhil navtascharaman dashatah, oordhavatriyagyabhyam)

UNIT IV

Electrical, Electronics & Aeronautical Engineering in Vedas: Concept of electrical Engineering, type of electricity – Tadit, Saudamini, Vidyut, Shatakoti, Haradini, Ashani. Electronics Engineering in Vedic literature. Aeronautical Engineering in Vedic literature, Types of Vimanas and their construction and working, Shakun viman, Rukma viman, Tripura viman, concept of calculator and ancient ways of computation.

UNIT V

Mechanical, Chemical, Civil & Architectural engineering in Vedic Literature: Mechanical & Chemical Engineering in ancient India, Art of Alchemy, Types of Iron and steel. Civil and Architectural engineering in Vedic literature. Concept of cryptography & Art of secret writing.

Text Books / References

1. Science in Vedas by Acharya Vaidyanath Sashtri.
2. Science in the Vedas by Hansraj, Shakti Publications, Ludhiana.
3. Vedic Mathematics by Swamisri Bharati Krishana Teerathaji, Motilal Banarasi Das, Delhi.
4. Brahad Viman shastra by Maharishi Bhardwaj.
5. Vymanika shastra, English translation by G. R. Josyer.
6. Alchemy and Metallic Medicines in Ayurveda by : Vaidya Bhagwan Das.
7. History of Hindu Chemistry by : P. C. Raya
8. Indian Alchemy by : Dr. S. Mahdihassan.
9. Ancient Scientist of Indian by Satya Prakash.
10. Vaishaishik Darshan by Maharishi Kanad.
11. Vedas : The sources of ultimate science by S. R. Verma, Nag Publisher, New Delhi.



BAP-C251
ENGINEERING PHYSICS LAB

MM: 50 **Sessional: 15**
Time: 2 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

LIST OF EXPERIMENTS

1. To verify the inverse square law of radiation using Photoelectric effect.
2. To determine the value of Planck's constant and photoelectric work function of the material of the cathode using Photoelectric cell.
3. To determine the frequency of an unknown signal by the drawing the Lissajous patterns for various frequency ratios and evaluate the phase difference between two sinusoidal signals applied to X and Y inputs of cathode ray oscilloscope.
4. To determine the value of e/m of an electron by helical method / Thomson method.
5. To verify the existence of Bohr's energy level with Frank-Hertz apparatus.
6. To determine the resistivity and energy band gap by Four Probe method.
7. To determine the Curie temperature of the given Ferrite material.
8. To investigate resonance in forced Oscillations and to find the Spring Constant.
9. To find the refractive index of the material of given Prism using Spectrometer.
10. To determine the wavelength of He-Ne laser by Diffraction Method.
11. To determine the specific rotation of sugar solution using Laurent's half-shade Polarimeter.

NOTE

1. Additional experiments may be added based on contents of syllabus.
2. In practical examination the student shall be required to perform one experiment.
3. A teacher shall be assigned 20 students for daily practical work in laboratory.
4. No batch for practical class shall consist of more than 20 students.
5. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
6. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BEE-C251
BASIC ELECTRICAL ENGINEERING LAB

MM: 50 **Sessional: 15**
Time: 2 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

LIST OF EXPERIMENTS

1. Verification of Kirchoff's laws.
2. Verification of Thevenin's theorems.
3. Verification of Norton's theorem
4. Verification of Superposition theorem.
5. Verification of maximum power transfer theorem.
6. Measurement of power in three-phase circuit by two wattmeter method.
7. Determination of efficiency of a single-phase transformer by load test.
8. To perform open circuit test on single-phase transformer & find equivalent circuit parameters.
9. To perform short circuit test on single-phase transformer & find equivalent circuit parameters.
10. D.C. generator characteristics
    (a) Shunt generator
    (b) Series generator
    (c) Compound generator
11. Speed control of D.C. shunt generator.
12. To study running and reversing of a three-phase Induction Motor.
13. To study & calibration of a single-phase Energy Meter.
14. Calibration of voltmeter and ammeter.
15. To study of resonance in RLC circuit.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BET-C251
ELECTRONICS DEVICES LAB

MM: 50 **Sessional: 15**
Time: 2 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

LIST OF EXPERIMENTS

1. To draw the V-I characteristics of PN junction diode.
2. To draw the V-I characteristics of Zener diode and study it as voltage regulator.
3. To study junction diode as half wave and full wave rectifier.
4. To study junction diode as clipper and clamper.
5. To draw the input and output characteristics of a transistor in CE and CB configuration.
6. To find the small signal h-parameters of a transistor.
7. To draw the input and output characteristics of FET and to measure the pinch off voltage.
8. To draw the drain and transfer characteristic curve of MOSFET.
9. To draw the frequency response of FET amplifier.
10. To draw the frequency response curve of Emitter Follower.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BME-C152/BME-C252
WORKSHOP PRACTICE

MM: 50 **Sessional: 15**
Time: 2 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

LIST OF EXPERIMENTS

Carpentry Shop

1. Study of Carpentry Tools, Equipment and different joints.
2. To prepare a half T joint of given dimensions.

Molding Shop

3. Introduction to Patterns, pattern allowances, Gate, Riser, and Runner.
4. To prepare a mold of half bearing.

Metal Joining.

5. To prepare a butt joint of MS strips using Arc welding.
6. To prepare a T joint of MS strips using Oxy Acetylene gas welding.

Fitting Shop

7. To prepare a rectangular piece with slant edge of given size from M.S. flat.

Machine Shop

8. To prepare a job on Lathe machine of given shape and size.
9. To prepare a job on Shaper machine of given shape and size.
10. To prepare a job on Milling machine of given shape and size.
11. To prepare a job on CNC train master of given shape and size.
12. To prepare a job on drilling machine of given shape and size.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BSP-S251
PHYSICAL TRAINING & YOGA

MM: 100 **Sessional: 50**
Time: 2 hrs
L T P **Credits 0**
0 0 2

UNIT-1

1. Warming Up (Meaning, Types and methods)
2. Components of physical fitness (strength, endurance, speed, flexibility and agility and coordinative ability)
3. Methods of Improving Strength
4. Methods of Improving Endurance
5. Methods of Improving Speed
6. Methods of Improving Flexibility
7. Limbering down

UNIT-2

1.Yama
2. Niyama
3. Asana
4. Shatkarma
5. Dharna and dhyana
6. Meditation and Samadhi



Revised Syllabus (**Effective from the session 2020-21**)
Gurukula Kangri Vishwavidyalaya, Haridwar
Faculty of Engineering & Technology
Computer Science & Engineering

BEM-C302
ENGINEERING MATHEMATICS – III

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Laplace Transform: Laplace transform of elementary functions, shifting theorems, transform of derivatives, Differentiation and Integration of transforms, Heaviside unit step and Dirac Delta functions, Convolution theorem, Solution of ordinary linear differential equations used in Mechanics, Electric circuits and bending of beams.

UNIT II

Fourier Transform: Definition of Fourier transform, Fourier sine and cosine transforms. Fourier integral formula, Parseval's identity, Applications of Fourier transform in solving heat equations.

UNIT III

Z transform: Definition, Linearity property, Z transform of elementary functions, Shifting theorems, Initial and final value theorem, Convolution theorem, Inversion of Z transforms, Solution of difference equations by Z transforms.

UNIT IV

Functions of Complex Variable: Limit and Continuity of functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

Unit V

Errors and Roots of Equations: Absolute, relative, round-off and truncation errors. Significant digits. Algebraic and Transcendental Equations, Numerical solution, Method of bisection, Newton-Raphson method, Direct iterative method, convergence.

Text Books / References

1. Kreyszig E., Advanced Engineering Mathematics, John Wiley, New York, 1999
2. Gerald, C.F., Wheatley P.O., Applied Numerical Analysis, Pearson, 2007.
3. Grewal B.S., Higher Engineering Mathematics, Khanna, New Delhi, 2000.
4. Jain R. K., Iyenger S.R.K., Advanced Engineering Mathematics, Narosa , 2002.
5. Jain R. K., Iyenger S.R.K., Jain M.K., Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 2012.



BCE-C305/BCE-C405
DATA STRUCTURE - I

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 3**
3 0 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Algorithm Design and Data Structure: Design & analysis of algorithm, Top-down and Bottom-up approaches to algorithm design, Analysis of Algorithm, Frequency count, Complexity measures in terms of time and space.
Arrays, Stacks and Queues: Representation of Array (Single & Multi-Dimensional Arrays), Address Calculation using column & row major Ordering, Array and linked representation and implementation of queues. Applications of Arrays, Stacks & Queues; Conversion from Infix to Postfix & Prefix and Evaluation of Prefix expressions using Stack**,** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque and Priority Queue

UNIT II

Linked List: Representation and Implementation of Singly Linked List, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and Deletion to/from Linked List, Insertion and Deletion Algorithms, doubly linked List, Linked List in Array, Polynomial representation and addition, generalized linked list, Uses and Application

UNIT III

Trees: Basic terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked representation of Binary trees, Traversing Binary trees.
Binary Search Tree: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of search algorithm, Path Length, AVL Tree, Balancing in AVL Trees, B-trees, uses and applications.

UNIT IV

Graphs: Introduction, Definition, Directed and undirected graph, Degree, incidence, adjacent vertices, path, cycle, connected and unconnected graph, complete graph, connectedness, weighted graph, subgraph, spanning trees.
Graph Representation: Adjacency matrix, adjacency list, Incidence matrix. Traversal of graph: Depth first search, Breadth first search. Shortest path problem, Dijkstra's algorithm. Minimum spanning tree, Kruskal's algorithm, prim's algorithm.



UNIT V

Searching: Sequential Search, Binary Search, Comparison and implementation.
Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two-way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.
Hashing: Hash table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. Uses and applications.

Text Books / References

1. Horowitz and Sahani, Fundamentals of Data Structure, Galgotia.
2. R.Kruse etal, Data Structures and Program Design in C, Pearson Education.
3. A M Tenenbaum etal, Data Structure using C & C++, PHI.
4. Lipschutz, Data Structure, TMH.
5. K. Loudon, Mastering Algorithms with C, Sheoff Publisher & Distributors.
6. Bruno R Preiss, Data Structures and Algorithms with Object Oriented Design Pattern in C++, John Wiley & Sons, Inc.
7. Yashwant Kanetkar, Pointers in C, BPB



BCE-C306
COMPUTER ARCHITECTURE AND ORGANIZATION

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 3**
3 0 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro-operation, Arithmetic Logic Shift Unit, Arithmetic Algorithms (addition, subtraction, Booth's Multiplication), IEEE standard for Floating point numbers.

UNIT II

Control Design: Hardwired & Micro Programmed Control Unit, Fundamental Concepts (Register Transfers, performing of arithmetic or logical operations, fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction.

UNIT III

Processor Design: Processor Organization: General register organization, Stack organization, addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer (RISC), Complex Instruction Set Computer (CISC).

UNIT IV

Input-Output Organization: I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.

UNIT V

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

Text Books / References

1. M. Mano, Computer System Architecture, PHI
2. Vravice, Zaky & Hamacher, Computer Organization, TMH Publication
3. Tannenbaum, Structured Computer Organization, PHI
4. Stallings, Computer Organization, PHI
5. John P.Hayes, Computer Organization, McGraw Hill



BET-C306
DIGITAL SYSTEM DESIGN

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 3**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Number System: Representation of negative numbers, 9's and 1's complement, 10's and 2's complement, arithmetic using 2's complement. BCD Code, Gray Code, Excess-3 Code, Introduction to Boolean algebra, Truth table verification of various gates, Realization of Switching functions with gates.

K- Map: Representation up to 4 variables, simplification and realization of various functions using gates, Tabular Method, Combinational logic and design procedure.

UNIT II

Combinational logic Circuits: Arithmetic circuits, Half and Full adder, Subtractors, BCD adders, Code Conversion, 4-bit Magnitude Comparator (IC -7485), Cascading of IC 7485, Decoder, Multiplexer, Demultiplexers, Encoders. Parallel Binary adder, IC 7483, 4-bit Binary parallel adder/subtractor,

UNIT III

Sequential Logic Circuits: Flip Flops, S-R latch, gated latches, Edge triggered Flip Flops, Master-slave Flip Flops, Conversion of flip flops, Analysis of clocked sequential circuits, Design of synchronous circuits, State transition diagram, state reduction and assignment.

UNIT IV

Counters: Design of Asynchronous and Synchronous Counters, two bits & four bits up & down counters and their design, Shift registers, Serial & Parallel data transfer, Shift left/Right register, Shift Register applications.

UNIT V

Logic Families: Diode switching, Transistors as a switching element, MOS as a digital circuit element, concept of transfer characteristics, input characteristics and output characteristics of logic gates, fan in, fan out, noise margin, Logic families: TTL, IIL, ECL, NMOS, & CMOS, Open collector outputs.

Text Books / References

1. M.Morris Mano, Digital Design, PHI
2. R.P.Jain, Modern Digital electronics, TMH
3. A.Anand Kumar, Fundamentals of Digital Circuits, PHI
4. Lee S.C, Modern Switching Theory and Digital design, PHI
5. Greenfield J.D., Practical Digital design using ICs, John Wiley.



BCE-C307
PYTHON PROGRAMMING

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 3**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Python – Installation, Python Interpreter, Usage and Customization, Editor setup - Variables, Expressions and Statements – Conditionals – Functions.

UNIT II

Variables, Expressions and Statement – Assignment Statements, Variables Name, Expressions & Statements, Order of Operations & String Operations.

UNIT III

Functions – Function Calls, Math Functions, Adding New Function, Definition & Uses, Parameters & Arguments.

UNIT IV

Conditional & Recursions – Boolean Expressions, Logical Operators, Conditional Execution, Chained Conditional Executions, Recursion.

UNIT V

Strings, Lists, Dictionaries, Tuples – Introduction to Strings, Lists, Dictionaries and Tuples Case Studies.

Text Books / References

1. The Python Tutorial available at http://docs.python.org/3.3/tutorial/
2. How to Think Like a Computer Scientist: Learning with Python (3nd edition) by: Peter Wentworth Jeffrey Elkner, Allen B. Downey, and Chris Meyers. Free Online Version: http://openbookproject.net/thinkcs/python/english3e/
3. Python Documentation available at http://www.python.org/doc/
4. A Byte of Python by Swarooph CH available at http://swaroopch.com/notes/python/



BCE-C355/BCE-C454

DATA STRUCTURE - I LAB

MM: 50 **Sessional: 15**
Time: 3 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

Write Program in C

1. Array implementation of Stack.
2. Array implementation of Queue.
3. Array implementation of Circular Queue.
4. Implementation of Linked List.
5. Implementation of Circular Linked List
6. Implementation of Doubly Linked List
7. Implementation of Stack using list.
8. Implementation of Queue using list.
9. Implementation of Binary Search Tree.
10. Insertion and Deletion in BST.
11. Implementation of Searching and Sorting Algorithms.
12. Implementation of a hash function.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BET-C355
DIGITAL SYSTEM DESIGN LAB

MM: 50 **Sessional: 15**
Time: 3 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

LIST OF EXPERIMENTS:

1. To verify the truth tables of various types of gates using IC 7400.
2. To verify the truth tables of Multiplexer & also implement a function using Multiplexer.
3. To design & verify the truth table of half & full adder.
4. To design & verify the truth table SR flip-flop using NOR/NAND gates.
5. To design & verify the truth table JK flip-flop using NOR/NAND gates.
6. To design & study Counters.
7. To design & study Shift registers.
8. To verify the truth tables of de Multiplexer.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



Gurukula Kangri Vishwavidyalaya, Haridwar
Faculty of Engineering & Technology
Computer Science & Engineering

BCE-C354
PYTHON PROGRAMMING LAB

MM: 50 **Sessional: 15**
Time: 3 hrs **ESE: 35**
L T P **Credits 1**
0 0 2

LIST OF EXPERIMENTS

1. Installation of spyder on any other IDE.
2. Working with IPE
3. Programs for variables
4. Programs for lists
5. Programs for tuples
6. Programs for dictionaries
7. Programs for functions
8. Programs for Boolean operators
9. Programs for logical operators
10. Programs for string operations
11. A small project



BCE-C356
PRESENTATION

MM: 50	**Sessional: 15**
Time: 3 hrs	**ESE: 35**
L T P	**Credits 1**
3 1 0	

Note:

1. A presentation on the topic of the internship or project or course completed in the summer vacations is to be submitted by the student and a presentation is to be given of duration at least 5 minutes.
2. The certificate along with a short report on the work accomplished during the training or the course studied is also to be submitted in the department in two copies with only spiral bind format.



BEM-C403
DISCRETE MATHEMATICS

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 4**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Sets and Propositions: Review of set theory, Combination of sets, Finite and Infinite sets, Uncountable Infinite sets, Mathematical Induction, Principle of Inclusion and Exclusion. Propositions.

UNIT II

Relations and Functions: Relation, Properties of primary relations, Equivalence relations and partitions, Partial ordering relations and lattices. Functions and the Pigeonhole principle.

UNIT III

Graphs and Planar Graphs: Basic terminology, Multigraphs and weighted graphs, Paths and circuits, shortest paths in weighted graphs. Eulerian paths and circuits, Hamiltonian paths and circuits, Planar graphs.

UNIT IV

Trees and Cut Sets: Trees, Rooted trees, Path lengths in rooted trees, Prefix codes, spanning trees and cut sets. Minimum spanning trees.

UNIT V

Generating Functions and Recurrence Relations: Introduction. Manipulation of numeric Functions, Generating functions, Recurrence relations, Linear recurrence relations with constant coefficients. Homogeneous solutions, Particular solutions, Total solutions. Solution by the method of generating functions.

Text Books / References

1. Rosen Kenneth H., "Discrete Mathematics and its Applications", McGraw Hill, 1988.
2. Liu, C. L(2/e)., Elements of Discrete Mathematics, TMH, New Delhi, 2000
3. Tremblay J.P. and Manohar R., Discrete Mathematical Structures with Application to Computer Science, McGraw, Singapore, 1988
4. Kolman B & Busby Robert C (3/e), Discrete Mathematical Structures for Computer Science, PHI, New Delhi, 2001



BCE-C408
DATABASE MANAGEMENT SYSTEM

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 3**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: An overview of Database Management System, Database System Vs File System, Database system concept and architecture, data models schema and interfaces, data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagram to tables, extended ER model, relationship of higher degree.

UNIT II

Relational Data Model and Language: Relational Data Model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain Constraints, relational algebra, relational calculus, tuple and domain calculus.

Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub-queries, Aggregate functions, Insert, update and delete operations, Joins, Union, Intersection, Minus.

UNIT III

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decomposition, normalization using FD, MVD and JDs, alternative approaches to database design.

UNIT IV

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view Serializable schedule, recoverability, Recovery from transaction failures, log-based recovery, deadlock handling.

UNIT V

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency control, Time stamping protocols for concurrency control, validation-based protocol, multiple granularities, multi-version schemes, Recovery with concurrent transaction, Transaction processing in Distributed system, Data fragmentation, Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distributed database.

Text Books / References

1. Date C.J., An Introduction to Database System, Addision Wesley.
2. Korth, Silbertz, Subaeshan, Database Concepts, McGraw Hill.
3. Elmasri, Navathe, Fundamentals of Database Systems, Addision Wesley.
4. Paul Beynon Davies, Database System, Palgrave Macmillan.

BCE-C406
OBJECT ORIENTED PROGRAMMING WITH JAVA

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credits 3**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Creation of Java, importance of Java to internet, byte code, OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

Classes and Objects: Concepts of classes and objects, class fundamentals Declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, garbage collection, overloading methods and constructors, parameter passing – call by value, recursion, nested classes and inner classes, exploring the String class.

UNIT II

Inheritance: Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

Packages and Interfaces: Defining, Creating and Accessing a Package, understanding class path, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT III

Exception Handling and Multithreading: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization.

UNIT IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database, selection, insertion, updating and deletion in database using JDBC.

UNIT V

Networking and Java Library: Basics of Networking, Inetaddress, TCP/IP sockets , datagrams, using sockets and datagram sockets to transfer data.

Servlets : Background, Life cycle of a servlet, Reading servlet parameters, Cookies and Session Handling, Database handling using servlets, Sharing data between different servlets.

Text Books / References

1. Herbert Schildt, The Complete Reference Java J2SE 5th Edition, TMH Publishing Company Ltd.
2. Cay Horstmann, ig Java 2nd Edition, John Wiley and Sons.
3. H.M.Dietel and P.J.Dietel, Java How to Program, Pearson Education/PHI
4. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals, Pearson Education.
5. Cay.S.Horstmann and Gary Cornell, Core Java 2- Advanced Features, Pearson Education.
6. Iver Horton, Beginning in Java 2, Wrox Publications.
7. Marty and Hall, Core Servlets and JSP, Prentice Hall and Sun Microsystems Press.
8. Deiltel & Deitel, Advanced Java, TMH

BCE-C407
OPERATING SYSTEM

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 3**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction: Operating System, Single Processor systems, Multiprocessor Systems, Clustered Systems, Mainframe Systems, Desktop Systems, Distributed Systems, Real Time Systems, System Components, Handheld Systems, Operating System Services, System Calls, System Programs, System Structure, Operating System Design and Implementation.

UNIT II

Process Management: Process Concept, Process Scheduling, Cooperating Processes, Inter-process Communication, Threads, Overview of Multithreading Models, CPU Scheduling, Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real Time Scheduling, Algorithm Evaluation.

UNIT III

Process Synchronization & Deadlocks: The Critical Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Deadlocks, System Model, Deadlock Characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT IV

Memory Management & Virtual Memory: Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual Memory, Demand paging, Page Replacement, Thrashing, Allocation of Frames

UNIT V

File System & Secondary Storage Structure: File Concepts, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management, Recovery, Disk Structure, Disk Scheduling, Disk Management, Swap Space management.

Text Books / References

1 Silberschatz, Galvin, Gagane, Operating System Concepts. Wiley India Edition.
2 William Stallings, Operating System, Pearson Prentice Hall.
3 D.M.Dhamdhere, Operating Systems, TMH.

BET-C411
MICROPROCESSOR AND INTERFACING

MM: 100 **Sessional: 30**

Time: 3 hrs **ESE: 70**

L T P **Credits 3**

3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain ten objective type questions of one mark each and student shall be required to attempt all questions Sec.-B shall contain ten short answer type question of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain eight descriptive type questions of ten marks each and students shall be required to attempt any four questions. Question shall be uniformly distributed from the entire syllabus. The previous year paper /model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

UNIT I

Introduction to Microprocessors and assembly language, 8085 architectures, addressing modes of 8085, 8085 instruction set and programming techniques, timing diagrams, Counters & time delays.

UNIT II

Stacks and subroutines, basics of memory interfacing. Interfacing I/O Devices, programming of basic arithmetic operations: addition, subtraction, multiplication, division, code conversion etc., Interrupts.

UNIT III

Programmable Peripheral Interface (PPI) (8255), Programmable Interval Timer (8254), Programmable interrupt controller (8259), DMA & DMA controller (8237), ADC / DAC interfacing.

UNIT IV

8086 Processor: 8086 architectures, Pin configuration, 8086 in min/max mode, addressing modes, Instruction set of 8086, Assembler directives, basic assembly language programming.

UNIT V

Overview of Advanced Microprocessors- 80186,286,386,486, Pentium – I, Pentium – II, Pentium – III, Pentium – IV.

Text Book

1. Microprocessor, architecture, programming and applications with 8085 R.S Gaonkar.

Text Books / References

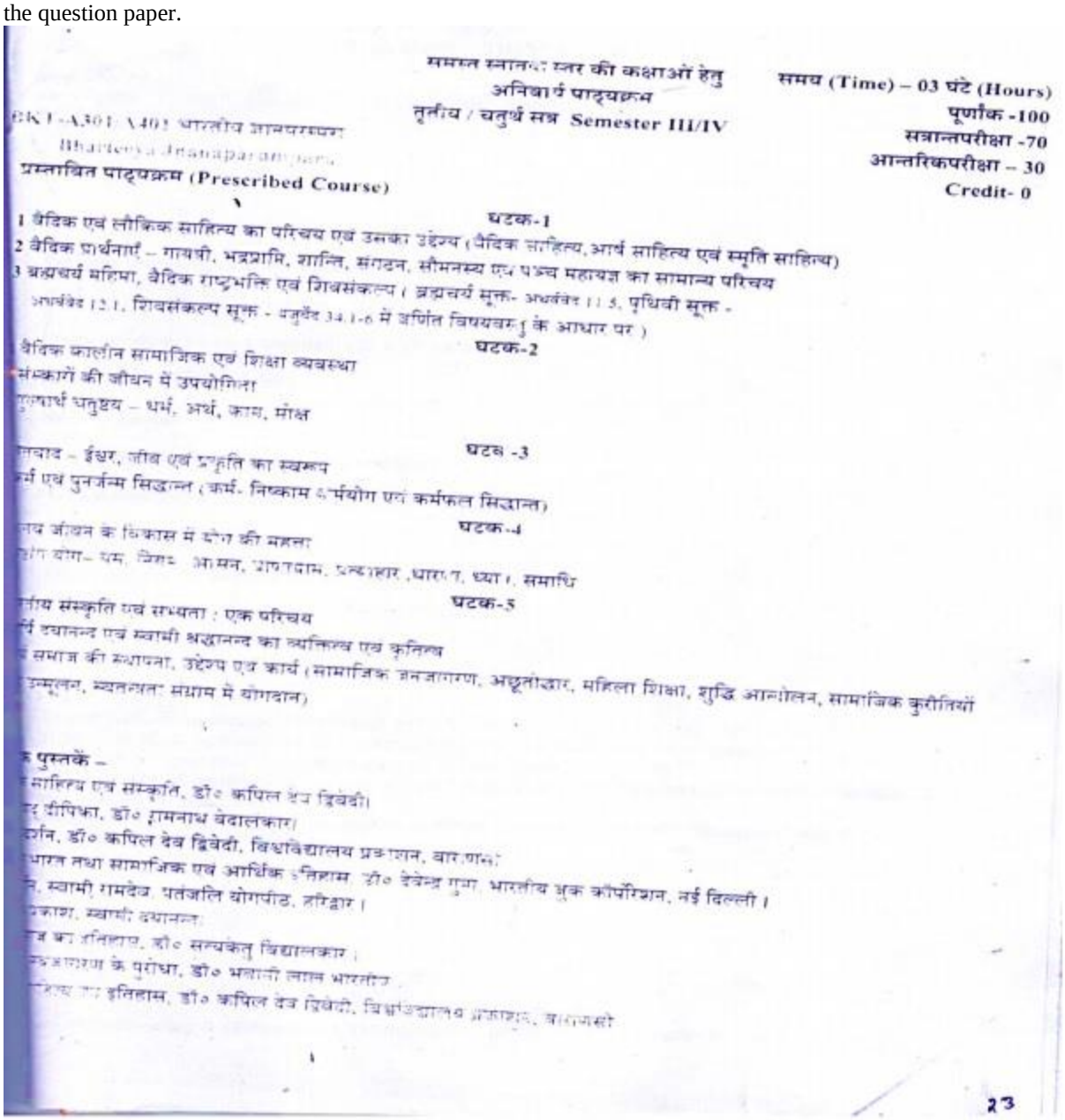
1. 8086 microprocessor: programming and interfacing the pc- K.J Ayala
2. 8051 microcontroller architecture programming and applications-K. J Ayala
3. Microprocessors and interfacing: Douglas hall.



BKT-A403
BHARTIYA GYAN PARAMPARA (IKT)

MM: 100 **Sessional: 30**
Time: 3 hrs **ESE: 70**
L T P **Credits 0**
3 1 0

NOTE: The question paper shall consist of three sections (Sec.-A, Sec.-B and Sec.-C). Sec.-A shall contain 10 objective type questions of one mark each and student shall be required to attempt all questions. Sec.-B shall contain 10 short answer type questions of four marks each and student shall be required to attempt any five questions. Sec.-C shall contain 8 descriptive type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.



समस्त स्नातक स्तर की कक्षाओं हेतु
अनिवार्य पाठ्यक्रम
तृतीय / चतुर्थ सत्र Semester III/IV

समय (Time) – 03 घंटे (Hours)
पूर्णांक -100
सत्रान्तपरीक्षा -70
आन्तरिकपरीक्षा – 30
Credit- 0

BKT-A301 / A401 भारतीय ज्ञानपरम्परा
Bharatiya Jnanaparampara

प्रस्तावित पाठ्यक्रम (Prescribed Course)

घटक-1

1 वैदिक एवं लौकिक साहित्य का परिचय एवं उनका उद्देश्य (वैदिक साहित्य, आर्ष साहित्य एवं स्मृति साहित्य)
2 वैदिक प्रार्थनाएँ – गायत्री, भद्रप्राप्ति, शान्ति, संगठन, सौमनस्य एवं पञ्च महायज्ञ का सामान्य परिचय
3 ब्रह्मचर्य महिमा, वैदिक राष्ट्रभक्ति एवं शिवसंकल्प (ब्रह्मचर्य सूक्त- अथर्ववेद 11.5, पृथिवी सूक्त -
अथर्ववेद 12.1, शिवसंकल्प सूक्त - यजुर्वेद 34.1-6 में वर्णित विषयवस्तु के आधार पर)

घटक-2

वैदिक कालीन सामाजिक एवं शिक्षा व्यवस्था
संस्कारों की जीवन में उपयोगिता
पुरुषार्थ चतुष्टय – धर्म, अर्थ, काम, मोक्ष

घटक -3

सवाद – ईश्वर, जीव एवं प्रकृति का स्वरूप
र्म एवं पुनर्जन्म सिद्धान्त (कर्म- निष्काम कर्मयोग एवं कर्मफल सिद्धान्त)

घटक-4

नव जीवन के विकास में योग की महत्ता
योग योग- यम, नियम आसन, प्राणायाम, प्रत्याहार, धारणा, ध्यान, समाधि

घटक-5

तीय संस्कृति एवं सभ्यता : एक परिचय
र्षि दयानन्द एवं स्वामी श्रद्धानन्द का व्यक्तित्व एवं कृतित्व
ह समाज की स्थापना, उद्देश्य एवं कार्य (सामाजिक जनजागरण, अछूतोद्धार, महिला शिक्षा, शुद्धि आन्दोलन, सामाजिक कुरीतियों
उन्मूलन, स्वतन्त्रता संग्राम में योगदान)

क पुस्तकें –
साहित्य एवं संस्कृति, डॉ० कपिल देव द्विवेदी।
र दीपिका, डॉ० रामनाथ वेदालंकार।
दर्शन, डॉ० कपिल देव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी।
भारत तथा सामाजिक एवं आर्थिक इतिहास, डॉ० देवेन्द्र गुप्ता, भारतीय बुक कॉर्पोरेशन, नई दिल्ली।
ति, स्वामी रामदेव, पतंजलि योगपीठ, हरिद्वार।
काश, स्वामी दयानन्द
ज का इतिहास, डॉ० सत्यकेतु विद्यालंकार।
जागरण के पुरोधा, डॉ० भगवती लाल भारतीय
रतीय का इतिहास, डॉ० कपिल देव द्विवेदी, विश्वविद्यालय प्रकाशन, वाराणसी

23

BCE-C455
DATABASE MANAGEMENT SYSTEM LAB

MM: 50 **Sessional: 15**

Time: 3 hrs **ESE: 35**

L T P **Credits 1**

0 0 2

List of Experiments:

1. Create table using sql commands.
2. Perform insertion, updation and deletion on tables.
3. Perform select queries on table.
4. Perform primary key, Candidate key and not null constraints.
5. Perform joins (Outer Joins).
6. Nested Queries.
7. Union, Intersection and except operations.
8. Foreign Key and Referential Integrity Constraints.
9. Create View of tables.
10. Grant and revoke permissions on tables.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-C456
OBJECT ORIENTED PROGRAMMING WITH JAVA PROGRAMMING LAB

MM: 50 **Sessional: 15**

Time: 3 hrs **ESE: 35**

L T P **Credits 1**

0 0 2

Write Following Programs in Java

1. Classes and Objects: Programs to illustrate the concept of object and classes.
2. Inheritance packages and interface: Programs to illustrate the concepts of Inheritance, packages and interfaces.
3. Multithreading: programs to illustrate concepts of multithreading in Java.
4. Event Handling: programs in Java to handle Mouse and Keyboard events.
5. Java Database Connectivity: Programs to connect, control and manipulate database.
6. Servlets: Programs to write, read and delete cookies in Servlets.
7. Program to create a database application in Servlets.
8. Program to implement session tracking.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BET-C461
MICROPROCESSOR & INTERFACING LAB

MM: 50 **Sessional: 15**

Time: 3 hrs **ESE: 35**

L T P **Credits 1**

0 0 2

LIST OF EXPERIMENT:

1. Addition of 8 bit hexadecimal numbers without carry.
2. Addition of 8 bit hexadecimal numbers with carry.
3. To calculate 2's compliments of a 8 bit number.
4. Subtraction of two 8 bit hexadecimal number.
5. Interfacing with 8255 in I/O mode & BSR mode.
6. Verification of all interrupts.
7. Multiplication of 8 bit hexadecimal number by 2.
8. Division of 8 bit hexadecimal numbers.
9. Addition of two 8 bit decimal numbers.
10. Transfer the block from one memory location to another.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-A460
SOFT SKILLS (MOOC COURSE)

MM: 50 **Sessional: 15**

Time: 3 hrs **ESE: 35**

L T P **Credits 1**

0 0 2

Note:

1. An online certification of soft skills has to be acquired by the students through any suitable online portal that provide a valid certificate for the course completion.
2. The course must be completed before the end of semester
3. The certificate will be verified by the coordinator faculty and will be submitted to the HOD after collecting all the certificates from the students for credit transfer
4. Internal assessment has to be taken by the faculty coordinator based on which the internal marks will be provided
5. External evaluation will be done as viva -voce/ presentation.

BCE-C511

COMPUTER NETWORK

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 4**
3 1 0

Prerequisites: None

Objectives:

The course has following objectives:

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

Outcomes:

- Understand OSI and TCP/IP models
- Analyze MAC layer protocols and LAN technologies
- Design applications using internet protocols
- Understand routing and congestion control algorithms
- Understand how the internet works

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Goals and Applications of Networks, Network structure and architecture, The Layered Architecture: Protocol Layering, The OSI Reference Model and the TCP/IP protocol stack, History of Computer Networking and the Internet, Network Topology, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling. Wireless Transmission: Radio transmission, Microwave transmission, Infrared and light wave transmission.

UNIT II

The Data Link Layer: Design Issues: Services provided to other Layer, framing, Error control, Flow control; Error detection and Correction; Simplex, Sliding window protocol, Using Go-Back n, Stop & Wait Protocol ARQ. The Medium Access Sub Layer: Static and Dynamic Channel Allocation in LANs and MANs; IEEE standard 802.3, 802.4, 802.5; CSMA.

UNIT III

The Network Layer: Network layer design issues, Shortest path routing, Flooding, flow- based routing, Broadcast routing, Congestion control and prevention policies Internetworking: connectionless Interworking, IP addressing, IPv4, Fragmentation.

UNIT IV

The Transport Layer: QOS, the transport service; Transport protocols: Addressing, Establishing and releasing a connection; TCP/UDP header. Session Layer-RPC, Synchronization, dialog management.

UNIT V

The Application Layer: Network Security, FTP, SNMP, Telnet, E- mail, Multimedia, WWW, DNS, SMTP. Presentation Layer: ASN, data compression, encryption. Multimedia Networking: Introduction, Streaming Stored Audio and Video, Real Time Streaming Protocol(RTSP), Protocols for Real Time Interactive Applications: RTP, RTCP, SIP, H.323; Providing multiple classes of service.

Text Books:

- Andrew S. Tanenbaum (3/e), Computer Networks, PHI
- Frouzan , Data Communications & Networking(3/e, 4/e)
- W.Stallings (5/e), Data and Computer Communications, PHI
- Douglas E.Comer (3/e), Interworking with TCP/IP,Principles, Protocols & Architecture
- D. Minoli, Internet & Intranet Engineering, TMH

References:

- Anuranjan Misra, “Computer Networks”, Acme Learning
- G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media



BCE-C512

ADVANCE DATA STRUCTURES

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 4**
3 1 0

Prerequisite: Knowledge of Data Structures

Objectives:

The course has following objectives:

- To ensure that the student evolves into a competent programmer.
- To inculcate the capability of designing and analyzing implementations of algorithms and data structures.
- To enhance the problem-solving approach of the student.
- To expose the student to the algorithm analysis techniques,
- To understand the theory of reductions, and to the classification of problems into complexity classes like NP.

Outcomes:

On completion of course, student will be able to:

- Design and analyze programming problem statements.
- Choose appropriate data structures and algorithms, understand the adt/libraries, and use it to design algorithms for a specific problem.
- Understand the necessary mathematical abstraction to solve problems.
- Come up with analysis of efficiency and proofs of correctness.
- Comprehend and select algorithm design approaches in a problem specific manner.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT I

Advanced Trees: Threaded Binary trees, Traversing Threaded Binary trees, recursive and non-recursive traversal of binary tree, Efficient non recursive tree traversal algorithms, B+ Tree, B* Tree, Weight Balanced Trees (Huffman Trees)

UNIT II

Search Trees: 2-3 Trees, 2-3-4 Trees, Red-Black Trees. Augmenting Red-Black Trees to Dynamic Order Statics and Interval Tree Applications. Operations on Disjoint sets and its union-find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues.

UNIT III

Advance Graphs: Representation of graph - Graph Traversals - Depth-first and breadth-first traversal, Applications of graphs, Definitions of Isomorphism Components, Circuits, Fundamental Circuits. Cut-Vertices Planer and Dual graphs, Spanning Trees, Strongly Connected Components and Articulation Point

UNIT IV

Graph Theory Algorithms: Algorithms for Connectedness, Spanning Trees and Planarity Testing Breadth First and Depth First Search, Topological Sort, Bellman-Ford algorithm, Floyd's Algorithm, network flow problems, Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms.

UNIT V

Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

Application of Pattern Matching: Social Network Analysis, Search Engine Working and Concepts, Search and find operations using string processing and Data Analytics.

Text Books:

- Introduction to Algorithms, by T. H. Cormen, C. E. Lieserson, R. L. Rivest, and C. Stein, Third Edition, MIT Press.
- Data structures and algorithms in C++(Java): Adam Drozdek
- Data structures and algorithms: Aho, Hopcroft and Ullman

References:

- Anany Levitin “Introduction to the Design and Analysis of Algorithms” Pearson Education, 2015
- E. Horowitz, S.Sahni and Dinesh Mehta, “Fundamentals of Data structures in C++”, University Press, 2007
- E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms/C++”, Second Edition, University Press, 2007
- Gilles Brassard, “Fundamentals of Algorithms”, Pearson Education 2015
- Harsh Bhasin, “Algorithms Design and Analysis”, Oxford University Press 2015
- John R.Hubbard, “Data Structures with Java”, Pearson Education, 2015
- M. A. Weiss, “Data Structures and Algorithm Analysis in Java”, Pearson Education Asia,2013



BCE-C513
DESIGN AND ANALYSIS OF ALGORITHM

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 4**
3 1 0

Prerequisite: Basic knowledge of data structure.

Objectives:

The course has following objectives

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcome:

At the end of course, the student will be able to

- Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.
- Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate).
- Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.
- Apply classical sorting, searching, optimization and graph algorithms.
- Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.
- Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
- Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
- Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT I

Introduction: Definition and characteristics of Algorithms; Analyzing algorithms; Program performance: time and space complexity, Asymptotic notation, complexity analysis. Recurrence equations and their solutions.

UNIT II

Time Complexity: Time as a resource, Linear Speedup theorem. Crossing Sequences and their applications. Hierarchy theorems.

Space Complexity: Space as a resource. PSPACE, L and NL. Reachability Problem, Completeness results. Savitch's theorem.

UNIT III

Dynamic Programming with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.

UNIT IV

Divide and Conquer with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. Greedy Methods with Examples Such as Optimal Reliability Allocation, Knapsack, **Minimum Spanning Trees** – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.

UNIT V

Infeasibility: P and NP classes; NP-hard problems Parallel algorithms: Introduction, data and control parallelism, parallel algorithms for matrix multiplication; embedding of problems graphs into processor graphs, load balancing and scheduling problems.

Text Books:

- Sahni S, Data structures, Algorithms and applications in C++, McGraw Hill.
- Aho, A.V., Hopcroft, J.E. & Ullman, J.D, The Design and Analysis of Computer algorithms, PHI.
- Mchugh J.A., Algorithmic Graph Theory, PHI.

References:

- Quinn M.J., Parallel Computing Theory & Practice, McGraw Hill.
- Goodman, S.E. & Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill.



BCE-C514

CLOUD COMPUTING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 4**

3 1 0

Prerequisites: Discrete Mathematics, Computer Networks

Objectives:

The course has following objectives:

- To understand the concepts of Cloud Computing.
- To learn Taxonomy of Virtualization Techniques.
- To learn Cloud Computing Architecture.
- To acquire knowledge on Aneka Cloud Application Platform.
- To learn Industry Cloud Platforms.

Course Outcomes:

At the end of this course student will be able to:

- Understand the concept of virtualization and how this has enabled the development of Cloud Computing
- Know the fundamentals of cloud, cloud Architectures and types of services in cloud
- Understand scaling, cloud security and disaster management
- Design different Applications in cloud
- Ability to use AWS/IBM Cloud/Google cloud

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and students shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and students shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Overview of cloud computing: What is a cloud, Definition of cloud, Characteristics of cloud, why use clouds, How clouds are changing, Driving factors towards cloud, Comparing grid with cloud, Public clouds (commercial)



UNIT II

Cloud computing concepts: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services, Management, tooling, and automation in cloud computing.

UNIT III

Cloud service delivery: Cloud service , Cloud service model architectures, Infrastructure as a service (IaaS) architecture , Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS) , Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details , Examples of SaaS applications , Trade-off in cost to install versus , Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform, Database as a Service - Monitoring as a Service –Communication as services.

UNIT IV

Cloud deployment scenarios: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment, Case study example: AWS Platform. Virtualization For Cloud Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

UNIT V

Security in cloud computing: Cloud security reference model, How security gets integrated, Cloud security, Understanding security risks, Principal security dangers to cloud computing, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches.

Classification of Cloud Implementations: Amazon Web Services, The Elastic Compute Cloud (EC2). The Simple Storage Service (S3), The Simple Queuing Services

(SQS), Google AppEngine - PaaS, Windows Azure; Aneka, Hadoop, A Comparison of Cloud Computing Platforms.

Text Books:

- Practices and Paradigms in Cloud Computing, RajKumar Buyya
- IBM , Handouts
- Michael Miller, Cloud Computing (1 ed.), Que Publishing, 2008. ISBN 978-0789738035.

Reference Books:

- Cloud Computing, Publisher: Jones and Barret India, Author : Kris Jasm
- Anthony Velte, Toby Velte and Robert Elsenpeter, Cloud Computing: A practical Approach (1 ed.), Tata McGrawHill, 2009. ISBN 978-0070683518.
- Judith Hurwitz, Robin Bllor, Marcia Kaufman and F Halper, Cloud Computing for dummies (1 ed.), Wiley, 2009. ISBN 978-8126524877.



BCE-M001

UNIVERSAL HUMAN VALUES

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 0**

3 0 0

Prerequisites: None

Objective: The Course has following objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Outcomes:

On completion of course, student will be able to:

- By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature).
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
- This is only an introductory foundational input. It would be desirable to follow it up by
  - faculty-student or mentor-mentee programs throughout their time with the institution.
  - Higher level courses on human values in every aspect of living. E.g. as a professional.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education.

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

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself**,** Understanding human being as a co-existence of the sentient 'I'& the Material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I' Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention & competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.



UNIT IV

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

Understanding the harmony in Nature, Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature. Understanding Existence as Coexistence of mutually interacting units in all- pervasive space. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: At the level of individuals: as socially and ecologically responsible engineers, technologists and managers. At the level of society: as mutually enriching institutions and organizations. Sum up Include practice Exercises and CaseStudies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book:

- Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

Reference Books:

- Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
- Small is Beautiful - E. F Schumacher.
- Slow is Beautiful - Cecile Andrews
- Economy of Permanence - J C Kumarappa
- Bharat Mein Angreji Raj – Pandit Sunderlal
- Rediscovering India - by Dharampal
- Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
- India Wins Freedom - Maulana Abdul Kalam Azad
- Vivekananda - Romain Rolland (English)
- Gandhi - Romain Rolland (English)



BCE-C561

ADVANCE DATA STRUCTURE LAB

MM : 50 **Sessional : 15**

Time : 2 hrs **ESE : 35**

L T P **Credits : 1**

0 0 2

Write Program

1. Implementation of Weighted Balanced Trees.
2. Implementation of Red-Black Tree.
3. Implementation of Threaded Binary Tree and there Traversal.
4. Implementation of Priority Queue.
5. Implementation of Heap Tree.
6. Implementation of Graphs.
7. Implementation of Depth First Search.
8. Implementation of Breadth First Search.
9. Implementation of Hashing.
10. Graph Implementation Min. cost spanning tree, shortest path algorithm.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in the laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-C562

CLOUD COMPUTING LAB

MM : 50 **Sessional : 15**

Time : 2 hrs **ESE : 35**

L T P **Credits 1**

0 0 2

List of practical's:

1. How to create a Virtual Machine on AWS cloud using EC2 service.
2. How to download and install applications on VM.
3. How to train a model using amazon sage maker in Machine Learning on AWS.
4. How to Deploy code on AWS.
5. How to deploy a static website by using the S3 service of AWS.
6. Create a chatbot using AWS services.
7. How to create users and roles in IAM services.
8. How to change policies in S3 Bucket services.
9. How to deploy serverless applications on Lambda by using serverless architecture.
10. How to download VMWare Workstation and install a VM on it.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in the laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-S570

SUMMER TRAINING AND INTERNSHIP PROGRAM-II PRESENTATION

MM : 50 **Sessional : 15**

Time : 2 hrs **ESE : 35**

L T P **Credits 1**

0 0 2

Objectives:

The course has following objectives:

- The objective of the summer training and internship program on recent/ latest technologies is to make students acquire knowledge of latest technologies and also to work under the guidance of industry professionals.
- Students will develop presentation, listening and communication skills.
- Students will develop Argumentative Skills and Critical Thinkin***g*.**

Course Outcomes:

- Students will gain knowledge of the current and upcoming technologies.
- Students will be able to look into the working environment in the industry.
- Students will develop better communication skills and critical thinking.

The presentation will be held for the Summer Training and Internship program done in summer break on recent/ latest technologies after IV semester examination, a certificate of completion to be submitted along with the presentation in the department. In case, any student is unable to do an internship in some company, he is allowed to do any one extra online skill enhancement course, for which the course completion certificate along with the presentation has to be submitted in the department.

Text Books/Learning Resources:

- Ford, Neal, Matthew McCullough and Nathaniel Schutta, Presentation patterns: Techniques for crafting better presentations (1 ed.), Addison- Wesley, 2012. ISBN 978-0321820808.



Program Elective - I

BCE-P515	Object Oriented Programming Using CPP
BCE-P516	Computer Graphics
BCE-P517	Machine Learning – I
BCE-P518	Software Engineering
BCE-P519	Data Analytics -1
BCE-P520	Complexity Theory



BCE-P515

OBJECT ORIENTED PROGRAMMING USING CPP

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Basic knowledge of programming.

Objective:

- Introduction to Object oriented Paradigm
- Features of object-oriented programming, class and object: state, identity, and behavior
- Data Abstraction and Data Hiding
- Encapsulation, Inheritance and polymorphism.
- Inheritance in OO design.
- Implementing OO language features.
- Memory management.
- Generic types and collections.

Course Outcome:

- Specify simple abstract data types and design implementations, using abstraction functions to document them.
- Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
- Name and apply some common object-oriented design patterns and give examples of their use.
- Prepare for competitive programming by implementing the concepts learned.

UNIT I

Introduction: Review of C, Difference between C and C++, Cin, Cout, new, delete operators, abstraction, encapsulation, inheritance, polymorphism, Structured versus object-oriented development, elements of object-oriented programming.

Class Overview: Class specification, class objects, accessing class members, defining member functions, outside member functions as inline, accessing member functions within a class, data hiding, access boundary of objects revisited, empty classes, pointers within a class, passing objects as arguments, returning objects from functions, friend functions and friend classes, constant parameters and member functions, structures and classes, static data and member functions, class, objects and memory resource, class design steps.



UNIT II

Object Initialization and Cleanup: Class revisited, constructors, parameterized constructors, destructor, constructor overloading, order of construction and destruction, constructors with default arguments, copy constructor, static data members with constructors and destructors.

Operator Overloading: Introduction, over loadable operators, unary operator overloading, operator keyword, operator return values, limitations of increment/decrement operators, binary operator overloading, arithmetic operators, data conversion, conversion between basic data types, conversion between objects and basic types, conversion between objects of different classes, overloading with friend functions.

UNIT III

Inheritance : Introduction, class revised, derived class declaration, forms of inheritance, inheritance and member accessibility, constructors in derived classes, destructors in derived classes, constructors invocation and data members initialization, overloaded member functions, multilevel inheritance, multiple inheritance, hierarchical inheritance, multipath inheritance and virtual base classes, hybrid inheritance.

UNIT IV

Virtual Functions and Classes: Introduction, need for virtual functions, static and dynamic binding, pointer to derived class objects, definition of virtual functions, pure virtual functions, abstract classes, virtual destructors.

Generic Programming with Templates: Introduction, function templates, overloaded function templates, multiple argument's function templates, user defined template arguments, class templates

UNIT V

Stream Computation with Files: Introduction, hierarchy of file stream classes, opening and closing of files, file modes, file pointers, sequential access to a file, saving and retrieving of objects, file input/output with stream class.

Exception Handling: Introduction, error handling, exception handling model, exception handling constructs.

Text Books:

- E.Balagurusamy, Object Oriented Programming with C++, TMH
- R.Lafore, Object Oriented Programming using C++, Galgotia

References:

- S.B.Lippman & J.Lajoie, C++ Primer, Addison Wesley
- G.Booch, Object Oriented Design & Applications, PHI



BCE-P516

COMPUTER GRAPHICS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: C, C++, Linear algebra, Matrices

Objectives:

The course has following objectives

- To understand about the different graphics display units.
- To study about the scan line and circle drawing algorithms.
- To learn about the various 2D and 3D transformations.
- To introduce the various hidden surface elimination algorithms.
- To study about the various color models used in computer graphics.

Outcomes:

On completion of course, student will be able to:

- Understand the basics of computer graphics, different graphics systems and applications of computer graphics.
- Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.
- Use of geometric transformations on graphics objects and their application in composite form.
- Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
- Understand the Color perception, color models (RGB, CMY, HLS), color transformations.
- Explore about Shading: illumination and surface modeling, Phong shading model, polygon shading.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction: Graphic displays: Random scan displays, raster scan displays, Frame buffer and video controller, points and lines, Raster and Random scan-Line and circle drawing algorithms-Polygon filling.



UNIT- II

2D Geometric Transformations: 2D Viewing – Window-Viewport Transformation - Two dimensional Geometric transformations – Line, Polygon, Curve and Text clipping algorithms.

UNIT – III

3D Geometric Transformations: Need for 3-Dimensional Imaging, Techniques for 3-Dimesional displaying, Parallel Projections, Perspective projection, Splines, viewing.

UNIT- IV

Hidden Surface Elimination: Hidden line elimination-Hidden surface elimination-Painter's algorithm-Scan the algorithm-Octree method-Z- buffer-Ray tracing.

UNIT – V

Color Models: Chromaticity diagram-RGB, CMY, HSV, HLS, CIE models-Realism in rendering, halving-Illumination and shading-Gouraud and Phong shading.

Text Books:

- Hearn D and Baker M.P., Computer Graphics, Second Edition, PHI.
- Foley J.D., Van Dam A, Fiener S.K. and Hughes J.F., Computer Graphics, Addison Wesley.
- Newman W.M. and Sproull R.F., Principles of Interactive Computer Graphics, Tata McGraw Hill Publishing Company Limited.

References:

- Hughes, Van Dam, et al. Computer Graphics Principles and Practice 3e, Pearson, 2014.
- P Shirley, Fundamentals of Computer Graphics, 2e, AK Peters, 2005.



BCE-P517

MACHINE LEARNING – I

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Understanding of Basic Programming Concept and Mathematics (probability and statistics).

Objectives: The course has following objectives

- To learn the fundamentals of Machine Learning.
- To understand basic component of an intelligence system.
- To explore applications of machine learning.
- To understand different types of machine learning algorithms and tools.
- To learn how to use machine learning model to solve real world problem.

Course Outcome:

On completion of course, student will be able to:

- List various approaches of Machine Learning.
- Describe machine learning algorithms to solve the real-world problems.
- Develop Hypothesis and machine learning models.
- Identify appropriate models for solving machine learning problems.
- Apply learning techniques to solve real world machine learning problems.
- Evaluate and interpret the results of the algorithms.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction to Machine Learning, Difference between Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL), Applications of Machine Learning, Limitations or need for applying ML algorithms, Types of Machine Learning and their use cases, Types of problem – Regression and Classification, Types of data – Structured Data and Unstructured Data. Batch and online learning.



UNIT- II

Tools required for machine learning- Python Libraries (Numpy, Pandas, Matplotlib etc), Framework for machine learning algorithm (Scikit-learn, TensorFlow, Keras, Anaconda, Google Colab etc), Popular ML Datasets (MNIST Dataset, IRIS Dataset, Wine quality dataset, ImageNet, IMDB reviews, Recommender Systems Dataset etc), Data repositories sources for machine learning practices (UCI Machine learning repository, Kaggle, Wikipedia, CMU, Google Dataset Search, The Big Bad NLP Database etc).

UNIT – III

Basic concept of Probability theory and Linear Algebra, Bias, Variance, Bias-Variance trade-off, overfitting and underfitting. Pre-processing of data - Data cleaning, wrangling and filtering, Handling missing and categorical data, Data scaling, Feature extraction and selection, covariance matrix, Dimensionality Reduction, Train-Test splitting strategy, Training Set, Validation Set, Test Set, Importance of cross validation – Holdout Method and K-fold cross validation.

UNIT- IV

Introduction to performance metrics for Machine Learning Algorithm – Root Mean Square Error (RMSE), Mean Absolute Error (MAE), Confusion Matrix, Classification Accuracy, Classification Report (Precision, Recall/Sensitivity, Specificity, F1-Score, Area Under ROC curve). Fine tuning of model – Grid Search, Randomized Search, Ensemble Method. Concept of Bagging.

UNIT – V

Introduction to regression problems, Types of regression – Linear Regression, Logistic Regression, Polynomial Regression. Introduction to classification problems and Types of classification - Binary Classification, Multi-Class Classification, Multi-Label Classification, Imbalanced Classification. Introduction to reinforcement learning and types - Model-Free and Model-Based RL.

Text Books:

- Introduction to Machine Learning, Alpaydin, E., MIT Press, 2004.
- Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller and Sarah Guido, O'Reilly, 2016.

Suggested Readings:

- Elements of Machine Learning, Pat Langley Morgan Kaufmann Publishers, Inc. 1995.
- The elements of statistical learning, Friedman, Springer series in statistics, 2001.
- The Hundred-page Machine Learning Book, Andriy Burkov, 2019
- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly, 2017.



BCE-P518

SOFTWARE ENGINEERING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: None

Objectives:

The course has following objectives:

- To meet the Computer Science Program Objectives.
- To understand principles, concepts, methods, and techniques of the software engineering approach to producing quality software (particularly for large, complex systems).
- To organize and manage a medium-sized software development project, including project plans and documentation, schedule and cost estimates, and quality assurance activities.
- To think critically about ethical and social issues in software engineering.

Course Outcomes:

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

- Independently design programs
- Produce professional-quality code
- Implement large programs of greater than 2.5k lines of code
- Design and execute tests to identify software bugs
- Repair software bugs, redesigning and refactoring code when necessary
- Utilize, analyze, and critique code written by others

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: Introduction to software Engineering, Software characteristics, Software components, Software applications, Software Engineering Principles, Software metrics and measurement, monitoring and control. Software development life-cycle, Water fall model, prototyping model, Incremental model, Iterative enhancement Model, Spiral model.



UNIT II

Software Requirement Specification: Requirements Elicitation Techniques, Requirement's analysis, Models for Requirements analysis, requirements specification, requirements validation.

System Design: Design Principles: Problem partitioning, abstraction. Top down and bottom up – design, structured approach. Functional versus object-oriented approach of design, design specification, Cohesiveness and Coupling. Overview of SA/SD Methodology, structured analysis, data flow diagrams, extending DFD to structure chart.

UNIT III

Software project Management: Project planning and Project scheduling. Software Metrics: Size Metrics like LOC, Token Count, Function Count. Cost estimation using models like COCOMO. Risk management activities. Software Reliability and Quality Assurance: Reliability issues, Reliability metrics, reliability models, Software quality, ISO 9000 certification for software industry, SEI capability maturity model.

UNIT IV

Testing: Verification and validation, code inspection, test plan, test case specification. Level of testing: Unit, Integration Testing, Top down and bottom-up integration testing, Alpha and Beta testing, System testing and debugging. functional testing, structural testing, Software testing strategies.

UNIT V

Software Maintenance: Structured Vs unstructured maintenance, Maintenance Models, Configuration Management, Reverse Engineering, Software Re-engineering.

Text Books

- R. S. Pressman, "Software Engineering – A practitioner's approach", 3rd ed., McGraw Hill Int. Ed..

Reference Books

- K. K. Aggarwal & Yogesh Singh, "Software Engineering", 2ndEd.,
- New Age International Sommerville, "Software Engineering", Addison Wesley.



BCE-P519
DATA ANALYTICS-1

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Basic knowledge of data structure.

Objectives:

The course has following objectives:

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

Course Outcome:

At the end of course, the student will be able to understand

- Describe the life cycle phases of Data Analytics through discovery, planning and building.
- Learn various Data Analysis Techniques.
- Implement various Data streams.
- Understand item sets, Clustering, frame works & Visualizations.
- Apply R tool for developing real time applications.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction to Data Analytics: Sources and nature of data, classification of data (structured, semi-structured, unstructured), characteristics of data, introduction to Big Data platform, need of data analytics, evolution of analytic scalability, analytic process and tools, analysis vs reporting, modern data analytic tools, applications of data analytics. Data Analytics Lifecycle**.**



UNIT II

Data Analysis: Regression modelling, multivariate analysis, Bayesian modelling, inference and Bayesian networks, support vector and kernel methods, analysis of time series: linear systems analysis & nonlinear dynamics, rule induction

UNIT III

Neural Networks: Learning and Generalisation, competitive learning, principal component analysis and neural networks, fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, stochastic variables and search methods.

UNIT IV

Mining Data Streams: Introduction to streams concepts, stream data model and architecture, stream computing, sampling data in a stream, filtering streams, counting distinct elements in a stream, estimating moments, counting oneness in a window, decaying window, Real-time Analytics Platform (RTAP) applications.

UNIT V

Frequent Itemsets and Clustering: Mining frequent itemsets, market-based modelling, Apriori algorithm, handling large data sets in main memory, limited pass algorithm, clustering techniques: hierarchical, K-means, clustering high dimensional data, CLIQUE and ProCLUS, frequent pattern-based clustering methods, clustering in non-euclidean space, clustering for streams and parallelism.

Text Books:

- Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.
- Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
- Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
- David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley
- Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series
- Michael Berthold, David J. Hand,” Intelligent Data Analysis”, Springer
- Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill.
- Mark Gardner, “Beginning R: The Statistical Programming Language”, Wrox Publication.
- Pete Warden, Big Data Glossary, O’Reilly.
- Glenn J. Myatt, Making Sense of Data, John Wiley & Sons.
- Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press.



Reference Books:

- Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer.
- Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”, Elsevier.
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer.
- Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier.



BCE-P520
COMPLEXITY THEORY

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Basic familiarity with computation, data structures & algorithms

Objectives:

The course has following objectives:

- The student should gain a better appreciation for what can be computed, and be able to recognize well-known difficult problems.
- Students should be familiar with standard terminology and notation and know definitions of terms.
- He or she should be able to carry out elementary proofs showing that problems are difficult to solve.
- The student should also be able to apply standard results of the theory of computation to his or her work, and be able to understand the significance of important new results as they come out.

Course Outcomes:

At the end of the course, the student will be able to understand:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyse worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm
- Synthesize divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm
- Synthesize dynamic-programming algorithms, and analyze them.
- Describe the greedy paradigm and explain its algorithmic design
- Synthesize greedy algorithms, and analyze them.
- Explain the major graph algorithms and their analyses.
- Synthesize new graph algorithms and algorithms that employ graph computations
- Analyse randomized algorithms
- Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
- Employ indicator random variables and linearity of expectation to perform the analyses.
- Explain what amortized running time is and what it is good for.
- Describe the different methods of amortized analysis
- Explain what competitive analysis is and to which situations it applies.
- Compare between different data structures.
- Pick an appropriate data structure for a design situation.



NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: Definition and characteristics of Algorithms; Analyzing algorithms; Program performance: Introduction to time and space complexity, Asymptotic notation, complexity analysis. Recurrence equations and their solutions.

UNIT II

Time Complexity: Time as a resource, Linear Speedup theorem. Crossing Sequences and their applications. Hierarchy theorems. P vs NP. Time Complexity classes and their relationships. Notion of completeness, reductions. Cook-Levin Theorem. Ladner's theorem. Relativization Barrier : Baker-Gill-Solovoy theorem.

UNIT III

Space Complexity: Space as a resource. PSPACE, L and NL. Reachability Problem, Completeness results. Savitch's theorem, Inductive Counting to show Immerman-Szelepscenyi theorem. Reachability Problems, Expander Graphs, SL=L

UNIT IV

Algorithmic Techniques: Algorithm design strategies such as recursion, Divide and conquer, greedy method, dynamic programming, back tracking, branch and bound examples, applications and analysis.

UNIT V

Infeasibility: P and NP classes; NP-hard problems Parallel algorithms: Introduction, data and control parallelism, parallel algorithms for matrix multiplication; embedding of problems graphs into processor graphs, load balancing and scheduling problems.

Text Books:

- Aho, A.V., Hopcroft, J.E. & Ullman, J.D, The Design and Analysis of Computer Algorithms, PHI
- Arora, Sanjeev, and Boaz Barak. Computational complexity: a modern approach. Cambridge University Press, 2009.

References:

- Du, Ding-Zhu, and Ker-I. Ko. Theory of computational complexity. Vol. 58. John Wiley & Sons, 2011.
- Mchugh J.A., Algorithmic Graph Theory, PHI
- Goodman, S.E. & Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill



BCE-O530

ADVANCE OPERATING SYSTEM

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Concept of Operating System

Objectives:

The course has following objectives:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating systems

Course Outcomes:

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

- Discuss the various synchronization, scheduling and memory management issues
- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
- Discuss the various resource management techniques for distributed systems
- Identify the different features of real time and mobile operating systems
- Install and use available open source kernel
- Modify existing open source kernels in terms of functionality or features used

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT I

Advance Operating Systems: Functions and services of operating systems, Processes and Threads - Process Scheduling Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques, types of advanced operating systems (NOS, DOS, Multiprocessor OS, Mobile OS, RTOS, Cloud OS).

UNIT II

Distributed Operating Systems: Issues in Distributed Operating System – Architecture – Communication Primitives –Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms – Agreement Protocols.

UNIT III

Distributed Resource Management: Distributed File Systems – Design Issues - Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol – Security and Protection.

UNIT IV

Multiprocessor Operating System: Introduction, Basic multiprocessor system architectures, design issues, Threads, Process synchronization: the test and set instruction, the swap instruction, implementation of the process wait Processor scheduling: Issues, Co-scheduling, Smart scheduling, Affinity Based scheduling.

UNIT V

Real Time And Mobile Operating Systems: Basic Model of Real Time Systems - Characteristics-Applications of Real Time Systems –Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

Text Books:

- Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.
- Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.

References:

- Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly, 2005.
- Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.
- Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

BCE-O531

FUNCTIONAL PROGRAMMING PRINCIPLES WITH SCALA

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Proficiency with Java or C# is ideal, but experience with other languages such as C/C++, Python, Javascript or Ruby

Objectives:

The course has following objectives:

- Understand the principles of functional programming
- Write purely functional programs, using recursion, pattern matching, and higher-order functions
- Design immutable data structures
- Combine functional programming with objects and classes

Outcomes:

By the end of this course, student will be able to:

- Understand the principles of functional programming
- Write purely functional programs, using recursion
- Pattern matching, and higher-order functions
- Combine functional programming with objects and classes
- Design immutable data structures
- Reason about properties of functions
- Understand generic types for functional programs

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



Unit I

Functional Programming overview with Scala – Basic types and operations, classes and objects, functional objects, functions and closure, composition and inheritance

Unit II

Singletons, Factories, and Builders Singletons and Null Objects, Builders

Unit III

Recursive structures Recursion, optimization and tail recursion, persistent data structures

Unit IV

Understanding Lazy Sequences The proxy pattern, Lazy evaluation, Infinite sequences – Scala streams, Recursive streams

Unit V

Functions as first class values: Currying, The decorator pattern

Unit VI

Higher Order Functions: The strategy design pattern, Functors, Monads, FlatMap, Monoids

Text Books:

- Functional Programming in Scala Paul Chiusano and Runar Bjarnason September 2014, ISBN 9781617290657

References:

- Programming in Scala, 3rd Edition, Martin odersky

BET-O532

SIGNALS AND SYSTEMS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Inclination to learn mathematics, basic knowledge of differential equations and difference equations, electrical circuits and networks.

Objectives:

The course has following objectives:

- Understand the concepts of continuous time and discrete time systems.
- Analyse systems in complex frequency domain.
- Understand sampling theorem and its implications.

Course Outcomes:

At the end of this course students will be able to:

- Analyze different types of signals
- Represent continuous and discrete systems in time and frequency domain using different
- transforms
- Investigate whether the system is stable
- Sampling and reconstruction of a signal

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Signals and Systems: Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

UNIT II

Fourier Series and Fourier Transform: The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equations.

UNIT III

Time and Frequency Characterization of Signals and Systems: Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.

UNIT IV

Sampling and Laplace Transform: Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.

UNIT V

Z-Transform: Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform. Random variable, random process correlation functions, Signals and systems as seen in everyday life, and in various branches of engineering and science.

Text Book:

- V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'signals & System', Pearson Education, Second Edition, 2003.

Reference Books:

- Roberts, "Signals and Systems" Tata McGraw Hills.
- P. Ramesh Babu, R. Ananda Natarajan,"Signals and Systems", SCITECH Publications.
- Charles L. Phillips, John M.PARR and EVEA. RISKIN, "Signals, Systems and Transforms", PEARSON Education, Third Edition.
- Chen 'Signals & Systems, Oxford University, Press.



BCE-O533

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: None

Objective: To learn the basic Business types, impact of the Economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome: The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT – I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and

Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.



UNIT – II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT – III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT – IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT – V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Introduction to Fund Flow and Cash Flow Analysis (simple problems).

Text Books:

- D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International
- Book House Pvt. Ltd. 2013.
- Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
- Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

Reference Books:

- Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
- S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

BCE-O534

INTRODUCTION TO AI

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Probability and statistics, Automata and languages

Objectives:

The course has following objectives:

- provide the most fundamental knowledge to the students so that they can understand what the AI is.
- eliminate theoretic proofs and formal notations as far as possible, so that the students can get the full picture of AI easily.
- Students who become interested in AI may go on to the graduate school for further study.

Outcomes:

- Understand AI's fundamental concepts and methods
- Acquire knowledge of modern AI tools, including Deep Learning framework TensorFlow and Deep Learning capabilities of RapidMiner.
- Learn how to apply AI-based methods to solving practical business problems
- Understand implications of AI for business strategies
- Examine where the AI technologies are heading within the next few years.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Processing.

UNIT II

Introduction to Search: Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.



UNIT III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

UNIT IV

Machine Learning: Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models.

Expert System: Existing Systems (DENDRAL, MYCIN) domain exploration Meta Knowledge, Self-Explaining System

UNIT V

Pattern Recognition: Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Line Finding, Interception Semantic & Model, Object Identification, Speech Recognition. Programming Language Introduction to programming Language, LISP, PROLOG

Text Books:

- Rich & Knight, Artificial Intelligence
- Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
- Charnick, Introduction to A.I., Addision Wesley

References

- Winston, LISP, Addision Wesley
- Marcellous, Expert System Programming, PHI
- Elamie, Artificial Intelligence, Academic Press
- Lioyed, Foundation of Logic Processing, Springer Verlag



BCE-O535

LINUX AND SHELL PROGRAMMING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: None

Objectives:

The course has following objectives:

- Essential ideas behind the open-source operating system approach to programming.
- Understanding Linux.
- How to use linux and build applications on it.
- To learn how to work on LINUX / UBUNTU platform to gain hands-on experience on LINUX.

Course Outcomes:

- Use various Linux commands .
- Manage File system and Process Management.
- Design and write application in linux.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction to LINUX and LINUX utilities: A brief history of LINUX, architecture of LINUX, features of LINUX, introduction to vi editor.

Basic Linux commands- PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip and other basic commands.

UNIT II

Permissions and User Management: Normal Permissions, Special Permissions, umask, acls and file level permissions, sudo and advance user management.



UNIT III

File System Management: Understanding File system, Creating partitions, raid, lvm , quota, magaing swap space.

Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir.

UNIT IV

Software Management: Using rpm.yum, implementing yum server, installing remiving packages.

Processes: waiting for a process, zombie processes, orphan process.

UNIT V

Introduction to Shells: Linux Sessiosn, Redirection, Pipes, Tee Command, Shell/Envrionment Customization.

Laboratory Experiments: Students will use LINUX / UBUNTU to gain hands-on experience on LINUX and Shell programming.

Text Books:

1. M. Ebrahim and A Mallett, Mastering Linux Shell Scripting: A Practical Guide to Linux Command-Line, Bash Scripting, and She (2 ed.), Packt Publication, 2018. ISBN 978-1788990554.
2. R. Blum and C. Bresnahan, Linux Command Line and Shell Scripting Bible (3 ed.), Wiley, 2016. ISBN 978-1118983843.

References:

1. R. Love, Linux System Programming (2 ed.), O'Reilly, 2013. ISBN 978-1449339531.
2. W.R. Stevens, Advanced Programming in the UNIX Environment (2 ed.), Pearson Education, 2017. ISBN 978-9332575905.
3. W.R. Stevens, UNIX Network Programming (3 ed.), PHI Publications, 2017. ISBN 978-8120307490.



BCE-C611

DISTRIBUTED SYSTEMS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 4**

3 1 0

Prerequisites: Familiarity with the design and analysis of sequential algorithms, knowledge of basic computer organization and elementary operating systems concepts are required.

Objectives: The course has following objectives:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
- To learn the characteristics of peer-to-peer and distributed shared memory systems.

Outcomes: At the end of the course, the student will be able to understand:

- Distributed Systems is concerned with the provision of ongoing reliable services to geographically dispersed users. The focus is networks, server architecture, protocols, security, resiliency, and scalability.

- Distributed and Concurrent Algorithms is concerned with the specification and proof of safety and liveness properties of key algorithms used in concurrent systems such as mutual exclusion. Its focus is the application of formal techniques.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Characterization of Distributed Systems-Introduction-Examples-Resource Sharing and the Web-Challenges. System Models-Architectural-Fundamental. Interprocess Communication- Introduction-API for Internet protocols-External data representation and marshalling--Client-server communication-Group communication- Case study: Interprocess Communication in UNIX.



UNIT II

Distributed Objects and Remote Invocation-Introduction-Communication between distributed objects-Remote procedure calls-Events and notifications-Case study: Java RMI. Operating System Support-Introduction-OS layer-Protection-Processes and threads- Communication and invocation OS architecture.

UNIT III

Distributed File Systems-Introduction-File service architecture-Case Study: Sun Network File System-Enhancements and further developments. Name Services-Introduction-Name Services and the Domain Name System-Directory. Services-Case Study: Global Name Service.

UNIT IV

Time and Global States-Introduction-Clocks, events and process states-Synchronizing physical clocks-Logical time and logical clocks-Global states-Distributed debugging.

Coordination and Agreement-Introduction-Distributed mutual exclusion-Elections-Multicast communication-Consensus and related problems. Authentication in distributed systems: Protocols based on symmetric cryptosystems, Protocols based on asymmetric cryptosystems, Password-based authentication, and Authentication protocol failures.

UNIT V

Distributed Shared Memory-Introduction-Design and implementation issues-Sequential consistency and Ivy case study Release consistency and Munin case study-Other consistency models. CORBA Case Study- Introduction-CORBA RMI-CORBA services.

Text Books:

- George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design", 4th Edition, Pearson Education, 2005.
- A.tS. Tanenbaum and M. V. Steen, "Distributed Systems: Principles and Paradigms", Second Edition, Prentice Hall, 2006.
- M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Addison Wesley, 2004.

References

- Mukesh Singhal, “Advanced Concepts In Operating Systems”, McGrawHill Series in Computer Science, 1994.
- Nancy A. Lynch, "Distributed Algorithms", The Morgan Kaufmann Series in Data Management System, Morgan Kaufmann Publishers, 2000.



BCE-C612

FORMAL LANGUAGES AND AUTOMATA THEORY

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 4**

3 1 0

Prerequisites: Maths Problems on Set Theory, Relations, Operations.

Course Objective:

This course will give an introduction to formal languages and automata theory. Automata and formal languages appear (possibly in various disguises) in almost every branch of computer science.

A main problem that we will discuss is how to define an infinite language in a finite way. A related problem is to construct an algorithm that can decide whether a string is in the language or not. Both problems are of practical importance, for instance for constructing compilers and design of programming languages.

At the end of the course, we will introduce the basics of the theory of computability. In particular we show that there exist uncomputable functions and that some tasks are unsolvable (i.e. no algorithm exists).

1. Introduce concepts in automata theory and theory of computation
2. Identify different formal language classes and their relationships
3. Design grammars and recognizers for different formal languages
4. Prove or disprove theorems in automata theory using its properties
5. Determine the decidability and intractability of computational problems

Outcomes:

The scope of automata theory is to develop methods by which computer scientists can describe and analyze the dynamic behavior of discrete systems, in which signals are sampled periodically. The behavior of these discrete systems is determined by the way that the system is constructed from storage and combinational elements. Automata Theory is an exciting, theoretical branch of computer science. It established its roots during the 20th Century, as mathematicians began developing – both theoretically and literally - machines which imitated certain features of man, completing calculations more quickly and reliably.

• Classify machines by their power to recognize languages.

• Employ finite state machines to solve problems in computing.

• Explain deterministic and non-deterministic machines.

• Comprehend the hierarchy of problems arising in the computer sciences.



NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Regular Languages: Finite State systems – Basic Definitions – Finite Automation – DFA & NFA – Finite Automaton with e-moves – Regular Expression – Equivalence of NFA and DFA – Equivalence of NFA's with and without e-moves – Equivalence of finite Automaton and regular expressions. Melay and Moore Machine.

UNIT II

Context Free Languages: Context Free Grammars – Derivations and Languages – Relationship between derivation and derivation trees – ambiguity – simplification of CFG –Derivation trees, sentential forms, right most and left most derivation. Greiback Normal form – Chomsky normal forms – Problems related to CNF and GNF.

UNIT III

Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Pushdown automata and CFL. Designing of PDA. Acceptance by final state , acceptance by null store.

UNIT IV

Turing Machines: Turing machines – Computable Languages and functions – Turing Machine constructions – Storage in finite control – multiple tracks – checking of symbols – subroutines – two way infinite tape, Types of turing machines.

UNIT V

Undecidability: Chomsky hierarchy of languages, linear bounded automata and context Sensitive language, LR(0) grammar, decidability of problems, Universal Turing Machine, undecidability of posts. Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text Books:

- "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education
- Introduction to Theory of Computation –Sipser 2nd edition Thomson

References:

- Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
- Introduction to languages and the Theory of Computation, John C Martin, TMH
- "Elements of Theory of Computation", Lewis H.P. & Papadimitriou C.H. Pearson /PHI.
- 4 Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI



BET-C610

EMBEDDED SYSTEMS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 4**

3 1 0

Prerequisites: Basic knowledge of Computer Architecture.

Objectives:

The course has following objectives:

- To understand the practical issues related to practical implementation of applications using electronic circuits.
- Choose appropriate components, software and hardware platforms.
- Work as a team with other students to implement an application.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

- Suggest design approach using advanced controllers to real-life situations.
- Design interfacing of the systems with other data handling / processing systems.
- Appreciate engineering constraints like energy dissipation, data exchange speeds etc.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design. Hardware Fundamentals for the embedded developers Digital circuit parameters. Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD's, Watchdog Timers, Hardware design and development.



UNIT II

Custom Single Purpose Processors: Optimizing program, FSMD, Data path & FSM. General purpose processors and ASIP's (Application Specific Instruction set Programming): Software and operation of general-purpose processors-Programmers View Development Environment-ASIPs Microcontrollers-DSP Chips.

UNIT III

Introduction to Microcontrollers and Micoprocessors, Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann Architectures. 8051 Microcontrollers-Assembly language, architecture, registers, Addressing modes, Instruction set, I/O ports and memory organization Interrupts Timer/counter and serial communication.

UNIT IV

RTOS- Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes. Advanced Processor-(only architectures) 80386, 80486 and ARM (References)

UNIT V

Communication basics, Microprocessor Interfacing I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel protocols and wireless protocols. Real world Interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Key board, Latch Interconnection, PPI.

Text Books:

- Embedded System Design-Frank Vahid/Tony Givargis, John Willey, 2005.

References Books:

- The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
- Microcontrollers (Architecture, Implementation & Programming) Kenneth Hintz, Daniel Tabak, Tata McGraw-Hill, 2005.
- 8051 Microcontrollers & Embedded Systems 2nd Edition-Sampath Kr, Katson Books, 2006.
- Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw-Hill, 2005.
- An Embedded Software Primer-David E.Simon, Pearson Education, 1999.



BCE-M002

INTELLECTUAL PROPERTY RIGHTS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: None

Objectives:

The course has following objectives:

- Understanding and practicing the professional ethics for young engineers.
- Understanding of patent law, and how patents are prosecuted and enforced.
- Understanding of the importance of intellectual property laws in modern engineering and the related ethical considerations involved.

Course Outcomes:

understand about the professional ethics,

understand the patent laws and importance of intellectual property laws in modern engineering.

Some important topics include: Senses of 'Engineering Ethics', Introduction to Patents, Subject matter of Copyright, IP Law Overview.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Engineering Ethics: Senses of 'Engineering Ethics'; variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, consensus and controversy, Models of Professional Roles, theories about right action, Self-interest, customs and religion, uses of ethical theories.

UNIT II

Patents: Introduction to Patents, Patentable Subject Matter, Novelty, Non-Obviousness, The Patenting Process, Novelty, Infringement, & Searching, Patent Applications, Claim Drafting, Patent Prosecution, Design Patents, Business Method Patents, Foreign Patent Protection, Computer-Related Inventions, Patent Enforcement; Technical Design-Around.



UNIT III

Copyrights: Introduction to Copyright, Subject matter of Copyright, Rights of the owners of the copyright, Authorship – ownership & licensing and assignment of Copyrighted work, Registration of Copyright & Authorities, Copyrights for Technology Protection.

UNIT IV

Intellectual Property Rights: IP Law Overview, Mask Works, Trade Secrets, Trademarks, Engineers & Scientists as Expert Witnesses.

UNIT V

Enforcement of Intellectual Property Right: Infringement of intellectual property right, UNFAIR COMPETITION: relationship between unfair competition and intellectual property law. misappropriation right of publicity. false advertising.

Text Books:

- H B Rockman, Intellectual Property Law for Engineers and Scientists (1ed.), IEEE Press, 2004**,** ISBN st 978-0471449980.



BCE-C661

DISTRIBUTED SYSTEMS LAB

MM : 50 **Sessional : 15**

Time : 2Hr **ESE : 35**

L T P **Credit : 1**

0 0 2

LIST OF PRACTICALS:

1. Program to implement non token based algorithm for Mutual Exclusion
2. Program to implement Lamport's Logical Clock
3. Program to implement edge chasing distributed deadlock detection algorithm.
4. Program to implement locking algorithm.
5. Program to implement Remote Method Invocation.
6. Program to implement Remote Procedure Call.
7. Program to implement Chat Server.
8. Program to implement termination detection

NOTE:

1. Minimum of 5 experiments have to be conducted.
2. In practical examination the student shall be required to perform one experiment.
3. A teacher shall be assigned 20 students for daily practical work in the laboratory.
4. No batch for practical class shall consist of more than 20 students.
5. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
6. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BET-C661

EMBEDDED SYSTEMS LAB

MM : 50 **Sessional : 15**

Time : 2Hr **ESE : 35**

L T P **Credit : 1**

0 0 2

LIST OF EXPERIMENT:

1. Program to interface LCD data pins to port P1 and display a message on it.
2. Program to interface keypad. Whenever a key is pressed, it should be displayed on LCD.
3. Program to interface seven segment display unit.
4. Program to interface LED display unit
5. Program to toggle all the bits of Port P1 continuously with 250 mS delay.
6. Program to toggle only the bit P1.5 continuously with some delay. Use Timer 0, mode 1 to create delay.
7. Program to interface ADC0808
8. Program to clear 16 RAM locations starting at RAM address 60H
9. Program to find the sum of the values 79H, F5H and E2H. put the sum in registers R0 (low bytes) and R5(high bytes)
10. Write a program to copy a block of 10 bytes of data from RAM locations, starting at 35H to RAM locations starting at 60H

NOTE:

1. Minimum of 8 experiments have to be conducted.
2. The programs have to be tested on 8051/89C51 Development board/equivalent using Embedded C Language/Assembly Language on Keil IDE or Equivalent
3. In practical examination the student shall be required to perform one experiment.
4. A teacher shall be assigned 20 students for daily practical work in laboratory.
5. No batch for practical class shall consist of more than 20 students.
6. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
7. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-P663

PROJECT

MM : 50 **Sessional : 15**

Time : 2Hr **ESE : 35**

L T P **Credit : 1**

0 0 2

Objectives:

The course has following objectives:

- Study and identify the problem area by studying and reviewing research papers.
- Implement the skills of software engineering and software project management.
- Improve upon the communication and presentation skills.

Outcomes:

- Students will get knowledge of problem identification and use their skills for team building and project development.
- develop a solution for any real-world problem.
- Students will get equipped with knowledge of latest/upcoming problems and solutions.
- Students will also be able to improve skills for project planning, implementation and communication.

Each student shall be assigned a Minor Project by departmental committee. The student shall be required to perform his project work under the supervision of the supervisor(s). There shall be a seminar on the project work of the student to be evaluated by a departmental committee chaired by H.O.D. The student shall be required to submit his project report in the form of dissertation 15 days before the end of VII semester. The student shall be required to submit three copies of the project work with a certificate from the supervisor(s) that the work is an authentic record of the work performed by him. The report shall be forwarded by H.O.D. The report of the project work shall be evaluated by the external examiner(s). The same external examiner(s) shall hold the viva-voce examination.

** - Marks for the project work shall be awarded jointly by the external and internal examiners after viva-voce examination.

*** - There shall be a seminar on the project work of the student to be evaluated by the

departmental committee chaired by H.O.D.

Text Books:

- Ford, Neal, Matthew McCullough and Nathaniel Schutta, Presentation patterns:Techniques for crafting better presentations (1 ed.), Addison- Wesley, 2012. ISBN 978-0321820808.

BCE-S670

SEMINAR ON LATEST TECHNOLOGIES

MM : 50 **Sessional : 15**

Time : 2Hr **ESE : 35**

L T P **Credit : 1**

0 0 2

Objectives:

The course has following objectives:

- Develop speech preparation and presentation techniques, audience awareness and self-awareness along with the cultivation of self-confidence.
- Demonstrate the ability to present scientific material in visual, written and oral form including the formulation of an effective presentation on a topic in the Computer Science domain.
- Demonstrate an ability to listen to a scientific presentation with the discussion of the strengths and weaknesses of a speaker's presentation.

Outcomes:

Students would be able to improve their presentation skills and work towards enhancing their self-confidence. This course helps the students to explore a domain of computer science and exploit their interest to demonstrate the ability to present scientific material in visual, written and oral form.

Importance of seminars/presentations in undergraduate studies. Introduction presentation with extemporaneous delivery approach (include information on likes/dislikes, hobbies, family, career goals, etc.) Experiencing the problems of talking in front of people, Understanding body Language. Considerations when preparing an oral presentation - audience, purpose, organization, flow, style. Presentation delivery approaches, Importance of visual aids, Designing effective presentations. Demonstration/How-To Speech - valuable information to the audience by demonstrating a process via visual aid. Informative speech/Speech of Explanation - original concept, policy, idea, or person, location or event to inform the audience about it via visual aids. Persuasive Speech - establish a problem with references and offering a solution via visual aids. Language of presentations: Explaining the title, outline, and summary, Explaining the background, problem, materials, methods, and processes, Explaining and discussing data in the form of figures and tables, Understanding and answering questions from the audience and Final presentations.

Text Books:

- Ford, Neal, Matthew McCullough and Nathaniel Schutta, Presentation patterns: Techniques for crafting better presentations (1 ed.), Addison- Wesley, 2012. ISBN 978-0321820808.



BCE-P614

MACHINE LEARNING –II

MM : 100 **Sessional : 30**

Time : 3Hr **ESE : 70**

L T P **Credit : 3**

3 0 0

Prerequisite: Knowledge of basic machine learning concept**,** Understanding of Basic Programming Concept and Mathematics (probability and statistics).

Objectives:

The course has following objectives

- To learn the fundamentals of Advanced Machine Learning.
- To understand basic components of an intelligence system for regression & classification problems.
- To explore applications and implementation of advanced machine learning.
- To understand different types of machine learning algorithms, framework and tools.
- To learn how to use machine learning models to solve real world problems.

Outcomes:

On completion of course, student will be able to:

- List various approaches of Advanced Machine Learning.
- Describe machine learning algorithms to solve the real-world problems.
- Develop Hypothesis and machine learning models.
- Identify appropriate models for solving machine learning problems.
- Apply learning techniques to solve real world machine learning problems.
- Evaluate and interpret the results of the algorithms.
- Choose an appropriate machine learning model for a defined problem.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Brief Recap of Fundamentals of Machine Learning, Overview of problem – Regression, Classification and clustering, Types of data – Low dimensional Data and High dimensional Unstructured Data. Machine Learning Tools, Frameworks, and popular public Data repositories. Basics of Linear Algebra, Pandas and Numpy Libraries.



UNIT II

Statistical decision theory - Bias, Variance, Bias-Variance trade-off, overfitting and underfitting, pre-processing of data - Feature extraction and selection, Dimensionality Reduction, Train-Test splitting strategy. Cross validation Techniques. Data exploration, Performance metrics for ML Algorithm, Fine tuning of model – Grid Search, Randomized Search, Ensemble Method. Concept of Bagging & Boosting.

UNIT III

Introduction to regression and classification problems, Linear regression in One Variable: Introduction, Gradient Descent Algorithm, Gradient Descent Implementation, Gradient Descent Update Rule for Regression, Data Preparation, Scoring, Surface Plots and Contours, Visualizing Loss function and Gradient Descent Trajectory. Linear regression in multiple variables: Gradient Descent for Multiple Variables, Features and Polynomial Regression.

UNIT IV

Dimensionality Reduction and Feature Selection: Data Compression and Visualization, Principal Component Analysis Problem Formulation, PCA Algorithms, Reconstruction from Compressed Representation, Choosing number of Principal Components. K Nearest Neighbors: Distance Metrics, 1-NN algorithm, K-NN algorithm, Weighted KNN algorithm, Performance of NN as data grows, Issues with high dimensions, high data scarcity and computational complexity, Classification using KNN.

UNIT V

K-Means Clustering: Intro to Clustering, Intro to Hierarchical Clustering, DBSCAN. Decision Trees and Random Forests: Intro to Decision Trees, Decision Trees implementation, Decision Forests Visualization using, Random Forests Ensembles. Bayes Theorem Formula and Proof, Naïve Bayes Classifier and Introduction and Implementation of Support Vector Machine (SVM).

Project Task - End-to-End Machine learning Model Development – Housing Price Prediction, Stock Price Prediction, MNIST Digit Classification.

Text Books:

- Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller and Sarah Guido, O'Reilly, 2016.
- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly, 2017.

Suggested Readings:

- Elements of Machine Learning, Pat Langley Morgan Kaufmann Publishers, Inc. 1995.
- Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge University Press, 2012.
- Pattern recognition and machine learning by Christopher Bishop, Springer Verlag, 2006.
- Machine Learning, Tom Mitchell, McGraw Hill, 1997.



BCE-P615

ADVANCE DATABASE MANAGEMENT SYSTEM

MM : 100 **Sessional : 30**

Time : 3Hr **ESE : 70**

L T P **Credit : 3**

3 0 0

Prerequisite: Students must have studied the DBMS.

Objectives:

- The course has following objectives:
- To understand the basic concepts and terminology related to DBMS and Relational Database Design
- To the design and implement Distributed Databases.
- To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports

Outcome:

On completion of course, student will be able to:

- Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries.
- Knowhow of the file organization, Query Optimization, Transaction management, and database administration techniques

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Formal review of relational database and FDs Implication, Closure, its correctness

UNIT-II

3NF and BCNF, Decomposition and synthesis approaches, Review of SQL99, Basics of query processing, external sorting, file scans

UNIT-III

Processing of joins, materialized vs. pipelined processing, query transformation rules, DB transactions, ACID properties, interleaved executions, schedules, serialisability



UNIT-IV

Correctness of interleaved execution, Locking and management of locks, 2PL, deadlocks, multiple level granularity, CC on B+ trees, Optimistic CC

UNIT-V

T/O based techniques, Multiversion approaches, Comparison of CC methods, dynamic databases, Failure classification, recovery algorithm, XML and relational databases

TEXT BOOKS:

1. R. Ramakrishnan, J. Gehrke, Database Managem /ent Systems, McGraw Hill, 2004
2. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

SUGGESTED READING:

1. K. V. Iyer, Lecture notes available as PDF file for classroom use.

BCE-P616

SOFTWARE PROJECT MANAGEMENT

MM : 100 **Sessional : 30**

Time : 3Hr **ESE : 70**

L T P **Credit : 3**

3 0 0

Prerequisite: None

Course Objective:

- To understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization's strategic goals.

Course Outcome:

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

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.
- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT I

Review of software engineering concepts: Managed Using Phased Lifecycle, Perform Continuous Validation, Maintained Disciplined Product Control, Use Modern Programming Practices (MPP), Maintain Clear Accountability for Results, Features of Good Software, Quality Requirement in Different Application Areas

UNIT II

Software Process: Software Process Definition: Software Process Models, Life Cycle Models, Waterfall Life Cycle Model, Incremental Life Cycle Model, Spiral Life Cycle Model Evolutionary Development Life Cycle Model, Prototyping Life Cycle Model Or Throwaway Prototyping, Object-Oriented Life Cycle Model, Winwin Spiral Life Cycle Model, Rational Unified Process, System Engineering, Software Specification, Software design and implementation, Software validation, Software evolution, Tools and Techniques for Process Modeling, Static modeling, Dynamic modeling.

UNIT III

Introduction to Project Management: Introduction of project, Activities by software project. Feasibility study, Planning, Project execution, Methodologies, Ways of categorizing software projects, Stakeholders, Setting objectives, project success and failures, Management, Principles of Project management, Principles of Project management, Initiation, Planning, execution, closure

UNIT IV

Software Project Planning: Introduction ,Projects and Activities, Sequencing and Scheduling Activities, Formulating a Network Model, Forward Pass and Backward Pass, Identifying the critical path , Shortening the Project Duration, Activity-on-Arrow Networks, Work Breakdown Structure, Generating the WBS, Criteria for completeness in the WBS, Estimating Activity Resources Requirements , Cost Estimation techniques, Joint Project Planning Session , Project Management Plan , Scope Management and Schedule Management, Cost Management and Quality Management, Human Resource and communication Management

UNIT V

Project Economics: Project Costing, Example for Project Costing, Software Project Estimation, Work Breakdown Structure (WBS), Measuring Effort for a Project, SLOC- Technique ,Function Point (FP) Technique, Project Scheduling and Tracking Techniques, COSMIC Full Function Points, Task Network and Scheduling Methods, Monitoring and Control Progress, Risk Concept and Risk Management, Software Metrics and Project Management

Text Books:

- Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

References:

- Robert K. Wysocki —Effective Software Project Management – Wiley Publication, 2011.
- Walker Royce: —Software Project Management- Addison-Wesley, 1998.
- Gopalaswamy Ramesh, —Managing Global Software Projects – McGraw Hill Education (India), Fourteenth Reprint 2013.

BCE-P617

DIGITAL SIGNAL PROCESSING

MM : 100 **Sessional : 30**

Time : 3Hr **ESE : 70**

L T P **Credit : 3**

3 0 0

Prerequisites: Fourier Analysis

Objectives:

The course has following objectives:

- Understand the concepts of Digital signals with the help of DFT and Z transform etc.
- Analyse systems in complex frequency domain.
- Understand various digital filtering technique and their implications.

Outcomes:

At the end of this course students will demonstrate the ability to

- Represent signals mathematically in continuous and discrete time and frequency domain
- Get the response of an LSI system to different signals
- Design of different types of digital filters for various applications

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Discrete Fourier Transform: Frequency Domain Sampling: The Discrete Fourier Transform Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT.



UNIT II

Efficient Computation of DFT: Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, efficient computation of the DFT of a 2NPointreal sequences, Gortezel Algorithm, Chirp Z-transform algorithm.

UNIT II

Basic IIR Filter Structures: Direct forms (I & II), cascade and parallel realizations. Signal flow graph, Transposed structure, Basic FIR filter structures-. Direct form structure, frequency sampling structure, Lattice structure, Linear phase FIR structure. FIR structures.

UNIT IV

Symmetric and Anti-symmetric: FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency Sampling Method, Design of FIR, Equi-ripple filter design Differentiators. Design of Hilbert Transformers.

UNIT V

Design of IIR Filters from Analog Filters: IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear Transformation. The Matched-z Transformation, Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev filters. Introduction to STFT, wavelets multirate Signal Processing architecture of DSP processor and application.

Text Book:

- Proakis, J.G & Manolakis, D.G., "Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall (India).

Reference Books:

- Sanjit K. Mitra, "Digital Signal Processing", Third Edition, TMH, 2005.
- Oppenheim A.V. & Schafer, Ronald W., "Digital Signal Processing", Pearson Education.



BCE-P618

HIGH PERFORMANCE COMPUTER ARCHITECTURE

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Knowledge of computer architecture

Objectives:

The course has following objectives:

- The objective of this course is to learn how to improve the quality of the programs that you write for execution on high performance computer systems.
- The course discusses the various activities that happen during program execution, and how they are managed by the hardware (architectural features) and system software (operating systems, run-time systems).

Course Outcomes:

At the end of the course, students will be able to –

- Comprehend various High-Performance Computing (HPC) system architectures
- Identify design issues related to the architectural characteristics and performance of HPC systems
- Design and implement compute intensive applications on HPC platform

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Parallel Computer Models: Computing states, Multiprocessors and Multicomputer, Multivector and SIMD Computers, Conditions of parallelism, Program Partitioning and scheduling, Program flow mechanisms, System interconnect architecture

UNIT II

Principles of Scalable Performance and Processor Hierarchy: Performance Metrics and Measures, Parallel processing applications, Speedup Performance Laws, Scalability Analysis and Approaches, Advanced Processor and Memory Hierarchy Technology, Distributed Shared Memory

UNIT III

Requirement and general issues of High-Performance Computing: Dependable Clustered Computing, Metacomputing: Harnessing Informal Supercomputers, Specifying Resources and Services in Metacomputing Systems, Load Balancing Over Networks, Job and Resource Management Systems

UNIT IV

Parallel Models and High-Performance Languages: Scheduling Parallel Jobs on Clusters, Parallel Programming Models, Parallel and High-Performance programming languages, Dependence Analysis of Data arrays

UNIT V

Advance Computing: Introduction to Petascale computing, Optical Computing, Quantum computing and its issues.

Text Books:

- Kai Hwang,Advance Computer Architecture: Parallelism, Scalability, Programmability, McGraw Hill International Editions
- Buyya, Rajkumar, High Performance Cluster Computing: Programming and Applications, Pearson Education

References:

- Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, CRC Press



BCE-P619
FULL STACK WEB DEVELOPMENT

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Academic level web application knowledge

Objective

1. Enable participants to develop a complete web application from the scratch that includes Front-end, Back-end and Data-exchange technologies
2. Build strong foundations (ex: OOPS) in entry level engineers thereby making them job ready as per industry requirements. Enable them to learn new technologies by applying foundation paradigms
3. By the end of the program participants will be become an industry-ready engineer who can be readily deployed in a project.

Course Outcome

1. Structure and implement HTML/CSS.
2. Apply intermediate and advanced web development practices.
3. Implement basic JavaScript.
4. Create visualizations in accordance with UI/UX theories.
5. Develop a fully functioning website and deploy on a web server.
6. Create visualizations in accordance with UI/UX theories.
7. Derive information from data and implement data into applications.
8. Authenticate, store, and structure user data.
9. Implement a RESTful backend API for storing and retrieving data via AJAX calls.
10. Will be able to use React.Js
11. Architect solutions to programming problems by combining visual components and classes, UI/UX using React.Js

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Fundamental of web development

Understanding browser internals: Rendering engine, Parsing - HTML parsing, CSS parsing, Render tree, Layouting, Painting, Engine's thread - Event loops, CPU, GPU, Memory, and multi-process architecture.

Building basic web apps using HTML, CSS & Javascript

HTML - HTML Basics, HTML Forms, HTML APIs.

CSS - Selectors, Box model, positioning, Pseudo-class, specificity, Animations.

Javascript - Fundamental, Object, Arrays, Functions, Events, Scope, Hoisting, Errors, this keyword, ES6, Conditions, Iterations, Debugging, Promises, Synchronous & Asynchronous flow.

UNIT II

Server side of web development

Understanding NodeJs - Fundamental, Modules, File System, NPM, Events, Callbacks, Global namespace, Garbage collection, NPM registry, HTTP server.

Building REST APIs using ExpressJs - Creating Basic Server, JSON, Middleware, Synchronous, Asynchronous, Dynamic Routes, Static Files, Template Engine, Streams, Error handling, MVC pattern.

UNIT III

Storage in depth

Understanding Browser storage - LocalStorage, Session Storage, Cookies, IndexedDB, Web SQL, Cache.

Storing application data in MongoDB - Fundamental, Create Database, Create Collections, Insert, Find, Query, Delete, Drop, Update, Join, Using Mongoose.

UNIT IV

Web security

Understanding authentication & authorization - Understanding basics of security, Access control, OAuth, Encryption, multi-factor authentication.

Vulnerabilities in Web Apps- Cross-Site Scripting (XSS), SQL Injection, Cross-Site Request Forgery, Denial of Service (DoS), Transport Layer Security (TLS)/ Secure Socket Layer (SSL), Server-side JavaScript Injection (SSJI)



Advanced web development

Building dynamic apps using ReactJs- ReactJs fundamentals, LifeCycle, Hooks, JSX, Component, State, Props, Synthetic events.

Web application performance - Measuring performance, Performance metrics - (FCP, LCP, FMP, TTI, FP), Improving Performance - (Assets Compressions, CDN, Caching, Lazy load, BundleSize, SSR, Prefetching).

Text Books:

- Jennifer Robbins, “Learning Web Design: A Beginner’s Guide to HTML, CSS, JavaScript, and Web Graphics”.
- Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites”.

Reference Books:

- Kyle Simpson, “You Don't Know JS: Up & Going”
- Matt Zandstra, “PHP Objects, Patterns, and Practice, Second Edition”
- Leonard Richardson, “RESTful Web APIs: Services for a Changing World”



BCE-P620
DATA ANALYTICS-2

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Basic knowledge of data structure and data analytics.

Objectives:

The course has following objectives:

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

Course Outcome:

At the end of course, the student will be able to understand

- Apply R tool for developing real time applications.
- Gain the principle concepts and foundational understanding of data analytics.
- Understanding of the statistical procedures most often used by practicing engineers.
- Demonstrate the business analytical techniques used in decision making.
- Understand item sets, classification, clustering and machine learning techniques.
- Employ tools and technologies to analyze data.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT- I

Supervised Learning with Regression and Classification Techniques: Bias-Variance Dichotomy, Linear and Quadratic Discriminant Analysis, Classification and Regression Trees, Ensemble Methods: Random Forest, Neural Networks, Deep Learning.



UNIT II

Machine Learning: Introduction and Concepts: Ridge Regression; Lasso Regression; and kNearest Neighbours, Regression and Classification.

UNIT III

Introduction to R: - R graphical user interfaces, data import and export, attribute and data

types, descriptive statistics, exploratory data analysis, visualization before analysis, 08 analytics for unstructured data.

UNIT IV

Classification: Decision Trees – Attribute Selection Measures and Tree Pruning; Bayesian and Rule-based Classification; Model Evaluation and Selection; Cross-Validation; Classification Accuracy; Bayesian Belief Networks; Classification by Backpropagation; and Support Vector Machine.

UNIT V

Business Analytics: Predictive Analysis (Regression and Correlation, Logistic Regression, InSample and Out-of-Sample Predictions), Prescriptive Analytics (Optimization and Simulation with Multiple Objectives).

Text Books:

- Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press.
- Bill Franks, Taming the Big Data Tidal wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, John Wiley & Sons.
- Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley
- David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big Data Analytics”, EMC Education Series, John Wiley
- Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series
- Michael Berthold, David J. Hand,” Intelligent Data Analysis”, Springer
- Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill.
- Mark Gardner, “Beginning R: The Statistical Programming Language”, Wrox Publication.
- Pete Warden, Big Data Glossary, O’Reilly.
- Glenn J. Myatt, Making Sense of Data, John Wiley & Sons.
- Pete Warden, Big Data Glossary, O’Reilly.
- Peter Bühlmann, Petros Drineas, Michael Kane, Mark van der Laan, "Handbook of Big Data", CRC Press.

Reference Books:

- Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer.
- Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”, Elsevier.
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer.
- Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier.

BCE-P621

CYBER FORENSICS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Network Security

Objectives:

The course has following objectives:

- To study computer forensics
- To know about mobile device forensics.
- To know about tools of forensics

Outcomes:

- Students will understand the usage of computers in forensic, and how to use various forensic tools for a wide variety of investigations.
- It gives an opportunity to students to continue their zeal in research in computer forensics

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT- I

Introduction of Cybercrime: Types, The Internet spawns crime, Worms versus viruses, Computers' roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response, Phase after detection of an incident



UNIT-II

Initial Response and forensic duplication, Initial Response & Volatile Data Collection from Windows system -Initial Response & Volatile Data Collection from Unix system – Forensic Duplication: Forensic duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive

UNIT – III

Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions**Network Forensics:** Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project.

UNIT -IV

Current Forensic tools: evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools.

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

UNIT- V

Working with Windows and DOS Systems: understanding file systems, exploring Microsoft File Structures, Examining NTFS disks, Understanding whole disk encryption, windows registry, Microsoft startup tasks, MS-DOS startup tasks, virtual machines.

Text Books:

- Kevin Mandia, Chris Prosise, “Incident Response and computer forensics”, Tata McGraw Hill,2006.
- Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
- Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning

Reference Books:

- Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education
- Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.



BCE-P622

AUGMENTED REALITY AND VIRTUAL REALITY

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: None

- Intermediate programming ability in C# or other object-oriented languages
- Familiarity with 3D game engines or strong desire to learn
- Basic linear algebra

Objectives:

The course has following objectives:

This course is to introduce students with the fundamentals of augmented reality (AR), and how to build an AR experience using ARCore. This course will address the use of AR in smart phones, Google AR. AR for shopping and retail. AR for business. AR for social media. AR for gaming. AR for education. AR for healthcare This course helps to identify different types of AR experiences using ARKit (Apple's Augmented Reality SDK for iOS). This course will cover different software and hardware tools and platforms used in the AR landscape. It will also cover popular use cases for AR and How AR experiences work.

Outcomes:

- How to identify different types of AR experiences.
- Tools and platforms used in the AR landscape.
- Popular use cases for AR and How AR experiences work.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction - The history of augmented reality. AR today: smart phones. Standalone. Google AR. AR for shopping and retail. AR for business. AR for social media.

AR for gaming. AR for education. AR for healthcare. AR for non-profits, The similarities and differences between AR and VR.



UNIT II

Placing and positioning assets - Scale and the size of assets. Occlusion. Lighting for increased realism. Solid augmented assets. Context awareness. Tracking in AR.

Outside-in tracking. Inside-out tracking. Motion tracking. Environmental understanding: feature points and plane-finding. Light estimation. Anchors. Interface issues

UNIT III

Introduction to ARKit (Apple's Augmented Reality SDK for iOS), Hardware supported features, ARKit Unique Features: World Maps, Object Detection, Environment

Probes. Fundamental Concepts: Motion Tracking, Environmental Understanding, Light Estimation, Plane Detection., ARKit Features: Face Tracking, Image Tracking.

3D Body Tracking, AR Foundation: Lightweight Render pipeline, Camera image API, AR object scaling. Head mounted AR, Environmental Mapping.

UNIT IV

Interaction in VR: 3D Interaction Design in Virtual Reality, Natural Interaction, Magic Interaction, Active and Passive Interaction, Affordances, VR Interaction Theory,

Standard HMDs, Other Devices, Interaction Scripts.

UNIT V

Moving around in VR: Introduction to Navigation in VR, Real Walking, Redirected Walking,Walk-in-Place, Virtual Navigation, Teleporting, Teleportation, Travel in VR, Implementing Walk in Place, Movement in VR.

Text Books:

- Micheal Lanhan, Learn ARCore - Fundamentals of Google ARCore (1 ed.), Packet Publishing Limited, 2018. ISBN 978-1788830409.
- Paul Mealy, Virtual & Augmented Reality for Dummies (1 ed.), Wiley Publishers, 2018. ISBN 978-1119481348.
- Michael Wohl, The 360° Video Handbook: A step-by-step guide to creating video for virtual reality (VR) (1 ed.), Michael Wohl, 2017. ISBN 978-0692904282.
- Steven M. LaValle, Virtual Reality, Cambridge University Press, 2019.E Book Link: http://vr.cs.ui

Reference Books:

- Luke Ahearn, 3D Game Textures (3 ed.), CRC Focal Press, 2011. ISBN 978-0240820774.
- Heather Maxwell Chandler, Game Production Handbook (3 ed.), Jones & Bartlett, 2013. ISBN 978-1449688097.
- Jason Gregory, Jeff Lander and Matt Whiting, Game Engine Architecture (3 ed.), A K Peters/CRC Press, 2018. ISBN 978-1138035454.
- Allen Sherrod, Ultimate 3D Game Engine Design & Architecture (1 ed.), Charles River Media game development, 2009. ISBN 978-1111055660.
- Steven M. LaValle, Virtual Reality (1 ed.), Cambridge University Press, 2019. ISBN 978-0521862059.



BCE-O630

APPLIED AI

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Some exposure to formal languages, logic and programming

Course Objectives:

This course will help the students to understand the fundamentals of AI techniques. They will learn the concepts of intelligent systems for pattern recognition and statistical reasoning, develop smart applications using AI, understand computational mathematics for learning and data analysis, explore the algorithms for heuristic search and state space search. An introduction to machine learning, deep learning etc. will also be provided.

Course Outcomes:

- Understand the need for Artificial Intelligence and the limitations of conventional methods.
- Design, Develop, and Implementation of various AI methods in Prolog, and in Python for prediction, regression, classification, clustering, Searching, and decision-making problems.
- Demonstrate the ideas behind selection of various AI methods and their use.

Note: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction of AI : The AI basics, AI Problems, The core assumptions of AI, The need of AI over the traditional methods, the AI Techniques, The level of the Model, Criteria for success and failure of the models, Artificial intelligence fundamentals, Machine learning, Human languages technologies, Distributed systems: paradigms and models for AI, Intelligent systems for pattern recognition, Smart applications using AI, Computational mathematics for learning and data analysis.



UNIT II

Algorithms for Heuristic search and State space search, Defining problem as state space search, Production Systems, Production Characteristics, Production System Characteristics, And issues in the design of search programs, Additional problems. Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Means-ends analysis.

UNIT III

Application of AI in Natural language processing, Introduction, syntactic processing, semantic analysis, discourse and pragmatic processing, spell checking, Measures of WordNet similarity, Sentiment analysis and opinions on the web.

UNIT IV

Exploring sub-discipline of AI: Machine Learning, Supervised learning, Unsupervised learning, Reinforcement learning, Classification problems, Regression problems, Clustering problems, Introduction to neural networks and deep learning.

UNIT V

Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.

Introduction to Prolog: Syntax and numeric function, Basic list manipulation functions in Prolog, functions, predicates and conditional, Input, Output and local variables, Iteration and recursion.

Text Books :

- Nils J. Nilsson, Artificial Intelligence: A New Synthesis (1 ed.), Morgan-Kaufmann, 1998. ISBN 978-1558605350.
- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (3 ed.), Pearson, 2010. ISBN 978-0136042594.

Reference Books:

- Bishop, Christopher M, Pattern Recognition and Machine Learning (1 ed.), Springer, 2006. ISBN 978-1493938438.
- Daniel Jurafsky and James H. Martin, Speech & language processing (2 ed.), Pearson Education India, 2000. ISBN 978-0131873216.
- Shalev-Shwartz, Shai, and Shai Ben-David, Understanding machine learning: From theory to algorithms (3 ed.), Cambridge university press, 2014. ISBN 978-1107512825.



BCE-O631

DIGITAL IMAGE PROCESSING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Data compression, MATLAB

Objectives:

The course has following objectives:

- To provide an idea of image, video.
- To provide the visualization of relationships between spatial and frequency.

Outcomes:

- The students shall be able to develop new state of the art image and video processing method.
- Process these images for the enhancement of certain properties or for optimized use of the resources.
- Develop algorithms for image compression and coding.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Digital Image Fundamentals-Elements of visual perception, image sensing andacquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

UNIT-II

Image Enhancements and Filtering- Gray level transformations, histogramequalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

UNIT-III

Image Compression: Image compression fundamentals; Coding Redundancy, Spatial and Temporal redundancy, Compression models; Lossy & Lossless, Huffman coding, bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding Still image compression standards–JPEG and JPEG-2000.

UNIT-IV

Basic Steps of Video Processing: Analog Video, Digital Video, Time Varying Image Formation models; Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT-V

2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block-Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding. Video Segmentation-Temporal segmentation–shot boundary detection, hard-cuts and soft-cuts; spatial segmentation–motion-based; Video object detection and tracking.

Text Books:

- R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008

Reference Books:

- Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004
- Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015



BCE-O632
INDUSTRIAL ECONOMICS AND BUSINESS ADMINISTRATION

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: None.

Objectives:

The course has following objectives

- To learn the basics of Industrial Economics and Business Administration.
- To acquaint the participants with the concepts and techniques used in economic theory and to enable them to apply this knowledge in business decision making and administration.
- To explain the use of Industrial Economics and Business Administration in current job scenario.
- To practical knowledge of Industrial Economics and Business Administration.
- To learn what is the use of Industrial Economics and Business Administration in practical life and busines.
- Students develop basic skills for the job market.
- Provide an authentic opportunity for students to develop teamwork and leadership skills.

Course Outcomes:

On completion of course, student will be able to:

- Develop a strong understanding of the Industrial Economics and Business Administration and how it can be applied for business purpose to treat problems in diseases.
- Emphasis is given to changes in the nature of business firms in the context of globalization.
- Learn to research and understand the unique needs of specific challenges in Industrial Economics and Business Administration.
- Develop the willingness to take a risk and the ability to deal with failure.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Industrial Economics: Definition of Industrial Economics, The Structure, Conduct, Elasticity of demand and supply, Demand forecasting methods, Consumption laws, Types of competition, Break even analysis, National income accounting, Trends in Industrialization in India, Economies of scale, Production Planning and control.



UNIT II

Money, Banking and Financial Management: Theories of Measurement of Concentration, Nature and functions of money, Functions of commercial and central banks, Credit creation in the banks, Balance of payment and trade, Foreign Exchange, Exchange control, Devaluation and Revaluation, Sources of Industrial Finance, Principles of accounting, Balance sheet & P & L A/C, Cash flow statement.

UNIT III

Principles of Management: Managerial functions - Planning, Organizing Leading & Controlling.

UNIT IV

Marketing Management: Concept of marketing management, P's of marketing, Product life cycle, Market segmentation.

UNIT V

Personnel Management and Industrial Psychology: Concept and importance of Personnel Management recruitment and selection, Training and development, Job evaluation, Fatigue, Accidents - causes and prevention, Nature of Industrial relations, Industrial disputes, Quality of work life.

Text Books:

- Dewtt. K.K., Modern Economic Theory" S. Chand, & Co (r) Ltd (r) 1999.
- Robbins (r) P. Stephen, Coutter Mary, 'Management' PHI 1998.
- Kotler Philip, 'Marketing Management', PHI latest edition.
- Nair N.G.,Latha Nair,Personnel Management and Industrial Relations', S.Chand &Co 1999.

Reference Books:

- Singh S.P. "Industrial Economics & Management" AITBS, New Delhi, 2006
- Kooutsnnis, 'Modern Economic Theory', PHI, 1996.
- Maheswari S.N., 'An Introduction to Accountancy' Vikas Publishing House 1999.
- Koontz Harold, O Donnel Cyril, Weihirch Heniz, 'Management', TMH-1983.
- Monoppan Arun, Sayadain S (r) Mirza, 'Personnel Management', TMH 1997 Edn.



BCE-O633

INTRODUCTION TO DATA SCIENCE AND DESIGN THINKING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Elementary programming knowledge

Objectives:

The course has following objectives

- An understanding of problems solvable with data science and an ability to attack them from a statistical perspective.
- An understanding of when to use supervised and unsupervised statistical learning methods on labeled and unlabeled data-rich problems.
- The ability to create data analytical pipelines and applications in Python.
- Familiarity with the Python data science ecosystem and the various tools needed to continue developing as a data scientist.
- To learn the basics of design thinking and good design concepts
- To explore design thinking applications in computer science
- To understand design-based issues of product and services
- Demonstrate the value of developing a local network and assist students in making lasting connections with the business community.
- Students develop a portfolio of work to set them apart in the job market.
- Provide an authentic opportunity for students to develop teamwork and leadership skills.

Course outcomes: On completion of course, student will be able to:

- Develop relevant programming abilities.
- Demonstrate proficiency with statistical analysis of data.
- Develop the ability to build and assess data-based models.
- Demonstrate skill in data management.
- Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively
- Develop a strong understanding of the design process and how it can be applied for development of product or service.
- Learn to research and understand the unique needs of specific challenges.
- Learn to build empathy for target audiences from different “cultures”.
- Learn to develop and test innovative ideas through a rapid iteration cycle
- Learn how to create physical prototypes / a visual representation of an idea
- Develop the willingness to take a risk and the ability to deal with failure

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

UNIT- II

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT – III

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT- IV

Introduction to Design Thinking: definition of design thinking, good design and bad design, importance of design thinking, applications of design thinking. Stages of Design thinking: Empathize, Define, Ideate, Prototype, Test and Implement.

UNIT – V

Case Studies, Design for Specific Culture: The Tooth Brush, Design for Rural Transport: Bullock Cart, Design for Ecology: The Bicycle, Design for Appropriate Technology: The Duster

Text Books:

- Saltz, Jeffrey S., and Jeffrey M. Stanton. *An introduction to data science*. Sage Publications, 2017.
- Jojo Moolayil, “Smarter Decisions: The Intersection of IoT and Data Science”, PACKT, 2016.
- Cathy O’Neil and Rachel Schutt, “Doing Data Science”, O'Reilly, 2015.
- Luchs, Michael G. "A brief introduction to design thinking." *Design thinking: New product development essentials from the PDMA* (2015): 1-12.

Suggested Readings:

- David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013
- Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.
- Cross, Nigel. *Design thinking: Understanding how designers think and work*. Berg, 2011.
- Meinel, Christoph, and Larry Leifer. "Design thinking research." *Design thinking research*. Springer, Berlin, Heidelberg, 2012. 1-11.



BCE-O634

DATA MINING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites:

- A course on "Database Management Systems"
- Knowledge of probability and statistics

Objectives:

The course has following objectives:

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering
- approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Outcomes:

- Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT – I

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns–

Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.



UNIT – II

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT – III

Classification: Classification and Prediction **–** Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

UNIT – IV

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

UNIT – V

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

Text Books:

- Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
- Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

Reference Book:

- Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.



BCE-O635
NATURAL LANGUAGE PROCESSING

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Course Outcomes

To understand natural language processing and importance of word representation. Apply deep learning to solve natural language problems such as language modelling, machine translation, POS tagging, Seq2Seq generation. Solve NLP problem in Indian context (Indian languages).

Unit I

Introduction, Ambiguity in language, Segmentation, Stemming, Tokenization, Representation of word, Sentence, Word embedding, Word Senses, Linguistic Structure:

Dependency Parsing.

Unit II

Word Window Classification, Neural Networks for text, N-gram Language Models, Perplexity, Hidden Markov Models, Viterbi algorithm, Recurrent Neural network,

Vanishing Gradients and exploding gradient.

Unit III

LSTM (Long sort term memory), GRU (Gated recurrent Unit), Part of speech tagging, BERT, XLnet.

Unit IV

Statically Machine Translation, Neural Machine Translation, Seq2Seq Modelling, Attention, Question Answering Bot.

Unit V

1D-CNN for NLP, Sub-word Models, Contextual Representations, Transformers, Self-Attention for Generative Models, Natural Language Generation, Neural Machine

Translation.

Studio Work / Laboratory Experiments:

The laboratory of Natural Language Processing is designed to provide a practical exposure to the students about the concepts and topics taught in the classroom

sessions.



Textbooks/Learning Resources:

- Daniel Jurafsky and James H. Martin, Speech and Language processing an introduction to Natural Language Processing, Computational Linguis (2 ed.), Prentice Hall, 2008. ISBN 978-0131873216.
- Steven Bird, Ewan Klein and Edward Lopper, Natural Language Processing with Python (2 ed.), O'Reilly, 2009. ISBN 978-0596516499.
- Siddiqui and Tiwari, Natural Language Processing and Information Retrieval (1 ed.), Oxford University Press, 2008. ISBN 978-0195692327.

Reference Books/Learning Resources:

- Nitin Indurkhya, Fred J. Damerau and Fred J. Damerau, Handbook of Natural Language Processing (2 ed.), Taylor and Francis, 2010. ISBN 978-1420085921.

BCE-O636
E-COMMERCE & SOCIAL MEDIA ANALYSIS

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisite: Basic knowledge commerce and internet.

Objectives:

The course has following objectives

- Understand fundamentals of E-commerce.
- Understand the method of Social Media Analytics and its impact on an organization's business.
- Learn to apply marketing fundamentals using digital media or the internet.

Course Outcome

On completion of course, student will learn to:

- Understand e-commerce applications.
- Understand customer shopping behavior.
- Understand social media and e-commerce analytics.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and students shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and students shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction to ecommerce: ecommerce analysis, digital economy ecommerce and development, ecommerce processes and use of data analytics, online vs offline retail and role of technology, benefits of ecommerce analysis, using the measurement plan, reporting vs analysis, analysis preparation; understanding customers: traffic source analysis, multi-channel analysis, customer profile analysis; understanding shopping behavior: enhanced ecommerce overview, on-site merchandising analysis, shopping behavior analysis, checkout analysis.



UNIT- II

Introduction to social media analytics: the role and structure of social media conversations, methods for and implications of gathering data, unlocking values from social data, social media monitoring vs listening, key metrics for analyzing data, methods for identifying trends in social data, the theory of social networks, methods for creating and interpreting data visualizations, social media crisis management.

UNIT – III

Ecommerce analysis: click stream analytics-basic concepts in web analytics, case study customer segmentation, conversion modelling, market basket analysis for recommendation engine, predicting fashion adoption; Machine learning and Big Data.

UNIT- IV

Understanding Web Analytics: Purpose, History, Goals & objectives, Web Analytic tools & Methods. Web Analytics Mistakes and Pitfalls. Search Engine Optimization: Meaning, Common SEO techniques, Understanding Search Engines, basics of Keyword search, Google rankings, Link Building, Steps to optimize website.

UNIT – V

Social Media Analytics tools: Buffer, ViralWoot, Google Analytics, Cyfe, TweetReach, IBM Watson Personality Insight, Social Rank; Application of Social Media Monitoring, role of social media in innovation, The Customer Profile: Your Brand's Secret Weapons, Methods for creating and interpreting data visualization.

TEXT BOOKS:

- Gary P Schneider, Electronic commerce, Thomson learning & James T Peny Cambridge USA, 2001. ISBN 978-0538469241.
- William Stallings and Lawrie Brown, Computer Security: Principles and Practice (3 ed.), Pearson, 2014. ISBN 978-0133773927.
- Fundamentals of Digital Marketing by Punit Singh Bhatia, Pearson

SUGGESTED READINGS:

- Judah Phillips, Ecommerce Analytics: Analyze and Improve the Impact of Your Digital Strategy, Publisher: PH Professional Business, 2016. ISBN 9780134177281.
- Marketing 4.0: Moving from Traditional to Digital by Philip Kotler, Publisher Wiley.
- The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley Publisher



BCE-O637

JAVA PROGRAMMING AND INTRODUCTION TO PYTHON

MM : 100 **Sessional : 30**

Time : 3 hrs **ESE : 70**

L T P **Credits 3**

3 0 0

Prerequisites: Basic knowledge of programming(C/C++) and concept of algorithm development.

Objective:

The course has following objectives

- To acquire programming skills in core Java and Python.
- To acquire Object Oriented Skills in Java.
- To solve simple problems using the fundamental syntax and semantics of Java & Python.
- To learn how to use lists, tuples, and dictionaries in Python programs.

Course Outcome:

On completion of course, student will be able to:

- Describe the features of Java & Python.
- Design classes with object-oriented features in Java
- Describe advanced features of Java like exception handling, multithreading etc.
- Write programs in JAVA and Python featuring its core capabilities

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and students shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and students shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: Features of Java byte code, data types, variables, declaring variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

Classes and Objects: Concepts of classes and objects, class fundamentals Declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, overloading methods and constructors, parameter passing – call by value, nested classes and inner classes, exploring the String class.



UNIT II

Inheritance: Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding classpath, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT III

Exception Handling and Multithreading: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization.

UNIT IV

Introduction to Python – Installation, Python Interpreter, Variables, Expressions and Statement – Assignment Statements, Variables Name, Expressions & Statements, Order of Operations & String Operations. Functions

UNIT V

Python Data Types: Strings, Lists, Dictionaries, Tuples – Introduction to Strings, Lists, Dictionaries and Tuples.

TEXT BOOKS:

- Herbert schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi.
- Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.
- Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
- Learning Python, Mark Lutz, Orielly.

SUGGESTED READINGS:

- Herbert Schildt, The Complete Reference Java J2SE 5th Edition, TMH Publishing
- Company Ltd.
- Head First Java, O'rielly publications.
- J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
- Think Python, Allen Downey, Green Tea Press.
- Core Python Programming, W.Chun, Pearson.



BCE-O657
JAVA PROGRAMMING AND INTRODUCTION TO PYTHON LAB

MM : 50 **Sessional : 15**

Time : 2 hrs **ESE : 35**

L T P **Credits 1**

0 0 2

Write Following Programs in Java

- Classes and Objects: Programs to illustrate the concept of object and classes.
- Inheritance packages and interface: Programs to illustrate the concepts of Inheritance, packages and interfaces.
- Multithreading: programs to illustrate concepts of multithreading in Java.
- Event Handling: programs in Java to handle Mouse and Keyboard events.
- Java Database Connectivity: Programs to connect, control and manipulate database.
- Servlets: Programs to write, read and delete cookies in Servlets.
- Program to create a database application in Servlets.
- Program to implement session tracking.

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in the laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-C711
COMPILER DESIGN

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 4**
3 1 0

PREREQUISITE: Theory of Computation.

OBJECTIVES:

The course has following objectives

- To learn the process of translating a modern high-level language to executable code.
- Provide an understanding of the fundamental principles in compiler design.
- To learn about the different parsing techniques.
- To apply the code generation algorithms to get the machine code for the optimized code.
- To represent the target code in any one of the code formats.
- To understand the machine dependent code.
- To draw the flow graph for the intermediate codes.
- To apply the optimization techniques to have a better code for code generation.

COURSE OUTCOME:

On completion of course, student will be able to:

- To realize the basics of compiler design and apply for real time applications.
- To learn about the parsing techniques.
- Apply for various optimization techniques for dataflow analysis.
- To know about compiler generation tools and techniques.
- Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.
- Construct the intermediate code representations and generation.
- Understand the major phases of compilation and to understand the knowledge of Lex tool & YAAC tool.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT-I

Introduction: What is system software. Introduction to system software. Assembler, Loader, Linker, Interpreter, Compiler.

UNIT- II

Compiler Structure: Compiler and translator, various phases of compiler, pass structure of compiler, bootstrapping of compiler.

Lexical Analysis: The role of lexical analyzer, a simple approach to the design of lexical analyzer, regular expressions, transaction diagram, finite state machines, Implementation of lexical analyzer,lexical analyzer generator : LEX, capabilities of lexical analyzer.

UNIT – III

Basic Parsing Techniques : Top down Parser with backtracking, recursive recent parsers, predicate parsers, bottom-up parsers, Shift-reduce parsing, operator precedence parsers.

UNIT- IV

Intermediate Code Generator: Different intermediate forms - Three address code, Quadruplex and triples, syntax direct translation mechanism and attributed definition. Translation of Declaration, Assignment, Control flow, Boolean expression, Array in arithmetic expression, produced calls, case statement, postfix translation.

UNIT – V

Code Optimization and Code Generation: Local optimization, loop, peephole optimization, basic blocks and flow graphs DAG, data flow analyzer, machine model, order of evaluation, register allocation of code selection.

Error Detection and Recovery: Lexical phases error, syntactic phase errors, semantic errors.

TEXT BOOKS:

- Alfred V Aho, Jeffrey D. Ullman, Principles of Compiler Design, Narosa.
- V. Aho, R. Sethi and J.D. Ullman, Compiler: Principle, Techniques and Tools, AW.
- H. C. Holub, Compiler Design in C, Prentice Hill Inc.

SUGGESTED READINGS:

- Apple, Modern Computer Implementation in C : Basic Design, Cambridge press.
- V Raghvan, " Principles of Compiler Design", TMH.
- Kenneth Louden," Compiler Construction", Cengage Learning.



BCE-C712
LINUX SYSTEM ADMINISTRATION

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 4**
3 1 0

PREREQUISITE: Basic Operating System knowledge.

OBJECTIVES:

To impart knowledge and skills on various practical and theoretical aspects of Linux operating system (OS) basics and Linux OS based server configuration, management and administration.

COURSE OUTCOME:

On completion of course, student will be able to:

- Understand concepts of Linux OS basics
- Learn various Linux based administration tasks
- Implement Linux OS based server configuration, management and administration.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and students shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and students shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction: Duties of the Administrator, Administration tools, Overview of permissions. Processes: Process status, Killing processes, process priority. Starting up and Shut down: Peripherals, Kernel loading, Console, The scheduler, init and the inittab file, Run-levels, Run level scripts. Managing User Accounts: Principles, password file, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users.

UNIT-II

Managing Unix File Systems: Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Boot disks Configuring the TCP/IP Networking : Kernel Configuration; Mounting the /proc File system, Installing the Binaries, Setting the Hostname, Assigning IP Addresses, Creating Subnets, Writing hosts and networks Files, Interface Configuration for IP, ifconfig, netstat command, Checking the ARP Tables; Name service and resolver configuration.



UNIT-III

TCP/IP Firewall : Methods of Attack, What Is a Firewall? What Is IP Filtering? Setting Up Linux for Firewalling Testing a Firewall Configuration; A Sample Firewall Configuration: IPAccounting, Configuring the Kernel for IP Accounting, Configuring IP Accounting, Using IPAccounting Results IP Masquerade and Network Address Translation : Side Effects and Fringe Benefits, Configuring the Kernel for IP Masquerade, Configuring IP Masquerade.

UNIT-IV

The Network Information System : Getting Acquainted with NIS, NIS Versus NIS+ , The Client Side of NIS, Running an NIS Server, NIS Server Security. Network file system: Preparing NFS, Mounting an NFS Volume, The NFS Daemons, The exports File.

UNIT-V

System Backup & Recovery: Log files for system and applications; Backup schedules and methods (manual and automated). Active Directory, LDAP.

TEXT BOOKS:

- L.L. Beck – "System Software " (3rd Ed.)- Pearson Education
- Michel Ticher – "PC System Programming", Abacus
- Kirch – " Linux network Administrator's guide (2nd Ed.)" – O'Rielly

SUGGESTED READINGS:

- E. Nemeth, G. Snyder, S. Seebass, T. R. Hein – " Unix system administration handbook" – Pearson Education.
- Maxwell – "Unix system administration" – TMH
- Limoncelli –"The Practice of System & Network Administration"-Pearson 6. Wells, LINUX Installation & Administration, Vikas.



BCE-C762
LINUX SYSTEM ADMINISTRATION LAB

MM : 50 **Sessional : 15**
Time : 2 hrs **ESE : 35**
L T P **Credits: 1**
0 0 2

List of Experiments:

1. Installation of operating system (Window 7 and LINUX)
2. Installation of office productivity software (MS Office/ Open Office)
3. User Management
4. Security Management
5. Startup & Shutdown scripts
6. Network planning – subnet creation
7. Firewall configuration
8. Basic properties of Windows Registry
9. Study of Important Windows Services
10. Study of Important LINUX Services

NOTE

1. In practical examination the student shall be required to perform one experiment.
2. A teacher shall be assigned 20 students for daily practical work in the laboratory.
3. No batch for practical class shall consist of more than 20 students.
4. The number of students in a batch allotted to an examiner for practical examination shall not exceed 20 students.
5. Addition/deletion in above list may be made in accordance with the facilities available with the approval of H.O.D./Dean.



BCE-P770
MINOR PROJECT WITH RESEARCH PAPER

MM: 100 **SESSIONAL: 30**
TIME: 3HR **ESE: 70**
L T P **CREDITS: 6**
0 0 8

COURSE OUTCOME:

1. Students will get knowledge of problem identification and use their skills for team building and project development.
2. develop a solution for any real world problem.
3. Students will get equipped with knowledge of latest/upcoming problems and solutions.
4. Students will also be able to improve skills for project planning, implementation and communication.

COURSE OBJECTIVE:

1. Study and identify the problem area by studying and reviewing research papers.
2. Implement the skills of software engineering and software project management.
3. Improve upon the communication and presentation skills.

Each student shall be assigned a Minor Project by departmental committee. The student is required to perform his project work under the supervision of the supervisor(s). There shall be a presentation on the project work of the student to be evaluated by a departmental committee chaired by H.O.D. The student is required to submit his project report along with a research paper in the form of dissertation 15 days before the end of VIII semester. The student is required to submit three copies of the project work with a certificate from the supervisor(s) that the work is an authentic record of the work performed by him. The report shall be forwarded by H.O.D. The report of the project work shall be evaluated by the external examiner(s). The same external examiner(s) shall hold the viva-voce examination.

** - Marks for the project work shall be awarded jointly by the external and internal examiners after viva-voce examination.

*** - There shall be a seminar on the project work of the student to be evaluated by the departmental committee chaired by H.O.D.

Textbooks/Learning Resources:

- Ford, Neal, Matthew McCullough and Nathaniel Schutta, Presentation patterns:Techniques for crafting better presentations (1 ed.), Addison- Wesley, 2012. ISBN 978-0321820808.



BCE-P713
WIRELESS NETWORKS

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Basics of Computer Networks.

OBJECTIVES:

The course has following objectives

- To study the evolving wireless technologies and standards
- To understand the architectures of various access technologies such as 3G, 4G, WiFi etc.
- To understand various protocols and services provided by next generation networks.

COURSE OUTCOME

On completion of course, student will be able to:

- Understand the transmission of voice and data through various networks.
- Have knowledge of latest wireless technologies and trends in the communication field.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction: Liberalization of communications Industry, Digitalization of content, changes in spectrum management, cellular reuse, drive towards broadband, IEEE 802.11 networks.

UNIT-II

Cellular networks : The GSM circuit switched network, GSM channel structure, Authentication and location updating, physical channels, TMN.
GPRS: Introduction to GPRS, contexts, PDP context, Mobility management context, MS-SGSN physical layer, MS-SGSN protocols, GPRS operations.

UNIT-III

Circuit voice networks: Introduction to CVN, coverage, capacity, planning for circuit multimedia services

Planning for packet multimedia services: Planning approaches, buffer-pipe model, characterization of applications, practical modelling methodologies, multiuser packet transport configurations

UNIT-IV

Planning and design: RAN, GSM RAN, UMTS RAN, Cellular OFDM RAN, Mesh network.

UNIT-V

Network operation and optimization: Enhanced telecom operations model (eTOM), wireless network life cycle – strategy, infrastructure and product, operations, enterprise management, GSM network performance optimization – principles and key performance indicators, coverage optimization, GPRS RAN optimization, UMTS network performance optimization.

TEXT BOOKS:

- Deploying Wireless networks, Andy wilton, Tim charity, Cambridge university press
- Fundamental of Wireless Networking, Ron Price, TMH

SUGGESTED READINGS:

- 3G Wireless Networks, Clint Smity, TMH
- Essentials of UMTS, Christopher Cox, Cambridge University Press



BCE-P714
INFORMATION AND NETWORK SECURITY

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None.

OBJECTIVES: To study various cryptographic algorithms and network security protocols.

COURSE OUTCOME

On completion of course, student will be able to:

- Define the concepts of Information security and their use.
- Describe the principles of symmetric and asymmetric cryptography.
- Understand and apply the various symmetric key algorithms.
- Understand and apply the various asymmetric key algorithms.
- Understand the concepts of hashing with algorithms and apply them.
- Understand and use the message authentication and its requirements.
- Understand the concepts of digital signature and digital certificates.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: Need for security, Introduction to security attacks, services and mechanism, introduction to cryptography, Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers, Intruders, Viruses and related threads.

UNIT II

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, cryptanalysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, key distribution.



UNIT III

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primarily testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms, Principals of public key cryptosystems, RSA algorithm, security of RSA, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

UNIT IV

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code (MAC), hash functions, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA), Public Key Infrastructure(PKI): Digital Certificate, private key management, Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

UNIT V

Authentication Applications: Kerberos and X.509, directory authentication service, password, challenge-response, biometric authentication, electronic mail security-pretty good privacy (PGP), S/MIME.

TEXT BOOKS:

- William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersy.
- Atul Kahate, "Cryptography and Network Security", TMH.
- Behrouz A. Forouzan, "Cryptography and Network Security", TMH.

SUGGESTED READINGS:

- Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag. BruceSchiener, "Applied Cryptography".



BCE-P716
HUMAN COMPUTER INTERACTION

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None.

OBJECTIVES:

- The course has following objectives
- Students will learn the basic physiological, perceptual, and cognitive components of human learning and memory.
- Students will gain theoretical knowledge of and practical experience in the fundamental aspects of designing and implementing user interfaces.
- Students will learn to analyze interaction problems from a technical, cognitive, and functional perspective.
- Students will develop an awareness of the range of general human-computer interaction issues that must be considered when designing information systems.

COURSE OUTCOME:

On completion of course, student will be able to:

- Ability to apply HCI and principles to interaction design.
- Ability to design certain tools for blind or PH people.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction and Interactive system design: Historical evolution of the field, Concept of usability -definition and elaboration, HCI and software engineering, GUI design and aesthetics, Prototyping techniques Model-based Design and evaluation: Basic idea introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and Hick- Hyman's law

UNIT II

Guidelines in HCI: Shneiderman's eight golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Contextual inquiry

UNIT III

Dialog Design: Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design

UNIT IV

Cognitive architecture
Introduction to CA, CA types, relevance of CA in IS design, Model Human Processor (MHP)

UNIT V

Object Oriented Programming:
OOP- Introduction, OOM- Object Oriented Modeling of User Interface Design

TEXT BOOKS:

- Dix A., Finlay J., Abowd G. D. and Beale R. Human Computer Interaction, 3rd edition, Pearson Education, 2005.
- Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. Human Computer Interaction, Addison-Wesley, 1994.

SUGGESTED READINGS:

- Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition) Authors: Shneiderman, Plaisant, Cohen, and Jacobs Publisher: Addison Wesley; 5th edition (2009) ISBN: 978-0321537.
- Introduction to Human Factors Engineering (2nd Edition) Authors: Wickens, Lee, Liu, and Gordon-Becker Publisher: Pearson, 2004 ISBN-10: 0131837362
- Yvonne Rogers, Helen Sharp, Jennifer Preece; Interaction Design 3rd Edition Wiley 2011 *Useability Engineering*; Morgan Kaufmann, Academic Press, London, 1993.



BCE-P717
BLOCKCHAIN

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None.

COURSE OBJECTIVES

The objective of this course is to provide conceptual understanding of block chain technology and how it can be used in Industry 4.0 The course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

COURSE OUTCOMES

At the end of this course, the students will be able to:

- Understand block chain technology.
- Understand Cryptocurrency
- Understand Smart contract
- Use Remix IDE
- Develop block chain based solutions and write smart contract using Ethereum Framework.
- Deploy Decentralized Application

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction: Overview of Block chain, History of Blockchain, Peer to Peer Network, Smart Contract, Wallet , Digital Currency, Ledgers, Types of Blockchain Platfrom .

UNIT-II

Consensus Mechanism: Permissioned Blockchain, Permisionless Blockchain , Different Consensus Mechanism- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance.



UNIT – III

Crypto currency and Wallet(With Practical Exercise): Types of Wallet, Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating a account in Metamask, Use of faucet to fund wallet, transfer of cryptocurrency in metamask.

UNIT – IV

Smart contract and Ethereum(With Practical Exercise*):* Overview of Ethereum, Writing Smart Contract in Solidity, Remix IDE , Different networks of ethereum, understanding blocks practically at blockhcain.com, how to compile and deploy smart contract in remix.

UNIT – V

Understanding Hyperledger Fabric: Overview of Open source Hyperledger project, Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

Use Cases
Enterprise application of Block chain: Cross border payments, Know Your Customer (KYC), Food Security, Block chain enabled Trade, We Trade – Trade Finance Network, Supply Chain Financing, Identity on Block chain, Blockchain in energy sector, Blockchain in governance.

TEXT BOOKS:

- Bettina Warburg, Bill Wanger and Tom Serres, Basics of Blockchain (1 ed.), Independently published, 2019. ISBN 978-1089919445.
- Herbert Jones, Blockchain (1 ed.), CreateSpace Independent Publishing Platform, 2017. ISBN 978-1977971708.
- Larry A. DiMatteo, Michel Cannarsa, Cristina Poncib, The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms (1 ed.), Cambridge University Press, 2019. ISBN 978-1108492560.

SUGGESTED READINGS :

- Antonopoulos and Andreas M., Mastering Bitcoin: unlocking digital cryptocurrencies (1 ed.), O'Reilly Media, Inc., 2015. ISBN 978-1449374044.
- Gaur and Nitin, Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric an (1 ed.), Packt Publishing Ltd, 2018. ISBN 978-1788994521



BCE-P718
DEEP LEARNING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Strong Knowledge of machine learning algorithms and concept, Understanding of Python Programming Concept and basic probability and statistics.

OBJECTIVES:

The course has following objectives

- To understand the fundamentals and complexity of Deep Learning algorithms and their limitations.
- To understand and master the basic components and tools of an intelligence system.
- To explore in depth deep neural architectures for learning and inference.
- To be capable of confidently applying common Deep Learning algorithms in practice and implementing their own.
- To learn how to use deep learning model to solve real world problem.

COURSE OUTCOME:

On completion of course, student will be able to:

- List various approaches of Deep Learning.
- Describe applications of deep learning algorithms to solve the real-world problems.
- Build own deep learning project.
- Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.
- Apply deep learning techniques to solve real world machine learning problems.
- Evaluate and interpret the results of the deep learning algorithms and choose appropriate model for the same.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and students shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and students shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT-I

Introduction to Deep Learning (DL), Applications of deep Learning, Limitations of deep learning algorithms, Artificial vs Biological Neurons, How do they learn?, Perceptron, introduction to Artificial Neural Network (ANN), Deep Neural Network, Transfer learning, Introduction to Feature Extraction vs Fine Tuning.

UNIT- II

Deep Learning Tools- Python - Numpy, Pandas, Scikit-learn etc, Framework for deep learning algorithm - TensorFlow, Keras, Google Colab etc, Popular Data repositories sources for machine learning practices (UCI, Kaggle, Wikipedia, Google Dataset Search), Working with Google Colab: Uploading data, Creating Data Generators, Working with OS Module, creating Val Dir, Training using 'fit_generator', Visualizing Results.

UNIT – III

Neural Networks - output vs hidden layers, Linear vs Nonlinear Networks, Activation Functions: Sigmoid, ReLU, Softmax. Loss function, Perceptron Training Rule, Multilayer Perceptron, Gradient Descent Rule. Gradient Descent and Backpropagation: Gradient Descent, Stochastic Gradient Descent, Backpropagation - recursive chain rule,

UNIT- IV

Introduction to Convolutional Neural Networks: Kernel filter, Principles behind CNNs, Multiple Filters, CNN applications. Padding, Data Augmentation, Introduction to Recurrent Neural Networks: Introduction to RNNs, LSTM, RNN applications.

UNIT – V

Optimization and Regularization: Overfitting and Capacity, Cross Validation, Feature Selection, Regularization, Hyperparameters, dropout, batch normalization. Early stopping of training, Deep Learning Applications: Image Processing, Natural Language Processing, Speech Recognition, Video Analytics, Transfer Learning. Project Task - End-to-End Deep learning Model Development – Cat Vs Dog Classification,

TEXT BOOKS:

- Deep Learning, Second edition, Ian Goodfellow, MIT Press, 2016.
- Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms, Nicholas Locascio, O'Reilly, 2017.

SUGGESTED READINGS:

- Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Peter Flach, Cambridge University Press, 2012.
- Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly, 2017.



BCE-P719
FUZZY LOGIC AND NEURAL NETWORKS

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Fundamental of Computing.

OBJECTIVES:

The course has following objectives

- Understand Soft Computing concepts, technologies, and applications
- Understand the underlying principle of soft computing with its usage in various applications.
- Understand different soft computing tools to solve real life problem.

COURSE OUTCOME

On completion of course, student will be able to:

- Develop applications on different soft computing techniques like Fuzzy, GA and Neural network.
- Implement Neuro-Fuzzy and Neuro-Fuzz-GA expert system.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction and Fuzzy Logic: Soft Computing definition, soft computing Vs hard computing, Applications of soft computing Techniques, Fuzzy set. Operation on Fuzzy set, fuzzy membership function, fuzzy proposition, fuzzy interferences, Fuzzy relations, application of fuzzy logics, removal of fuzziness. Neuro-Fuzzy modelling.

UNIT II

Evolutionary Algorithms like Genetic Programming, Genetic Algorithm, Optimization of ANN using Evolutionary Algorithms, Fuzzy Logic, Member ship function, how to improve the model, diversity, training time, partitions of datasets.

UNIT III

Statistical Reasoning: Probability and Bays' Theorem, Certainty Factors and Rule-Base Systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic. AI for knowledge representation, rule-based knowledge representation, procedural and declarative knowledge, Logic programming, Forward and backward reasoning.

UNIT IV

Finite State Machines: Basic State Machine Model, Finite State Machine Design with Examples. Fuzzy Logic: Usage of Fuzzy Logic in Games. Basics of Fuzzy Logic, Examples of Control and Threat Assessment. Rule-Based AI: Rule-Based System Basics, Fighting Game Strike Prediction. Decisions Under Uncertainty-Bayesian Techniques: What is a Bayesian Network, Trapped and Treasure, Examples.

UNIT V

Reasoning: Handling uncertainty Non-Monotonic Reasoning, Probabilistic reasoning, use of certainty factors, fuzzy logic. Learning Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets.

TEXT BOOKS

- F. Martin, Mcneill, and Ellen Thro, Fuzzy Logic: A Practical approach (1 ed.), AP Professional, 2000. ISBN 978-0124859654
- "Neural Networks in Computer Intelligence" by KM Fu, McGraw Hill (ISBN-9780136042594),1992

SUGGESTED READINGS:

- L. Fausett, Fundamentals of Neural Networks, Prentice Hall
- T. Ross, Fuzzy Logic with Engineering Applications, Tata McGraw Hill



BCE-P720
REAL TIME OPERATING SYSTEMS

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITES: Concepts of Operating systems, Basics of task management and task scheduling.

COURSE OBJECTIVES:

- To acquire knowledge about concepts related to OS such as Scheduling techniques, threads, inter-thread communications, memory management.
- To acquire knowledge about different types of scheduling algorithms
- To study about FreeRTOS
- To understand the various functions of RTOS

COURSE OUTCOMES:

- Real-time scheduling and schedulability analysis
- Formal specification and verification of timing constraints and properties
- Development and implementation of new techniques to advance the state-of-the-art real-time systems

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Real Time Systems:
Introduction to Real Time Systems, Classification of Real Time System, Concept of Computer Control, Types of Real Time Operating Systems.
Requirements for Real Time Systems: Human Computer Interaction in Real Time Systems, Hardware Requirement for Real time Systems, Specialized Processors, Interfaces & Communications.

UNIT-II

Real Time Operating Systems: RTOS Overview, RTOS Components, Task Management & Memory Management, Scheduling Strategies, Commercial Real-time Operating Systems. Types of multitasking, Task Scheduling, Task states, Non-Preemptive scheduling, Pre-emptive Scheduling, Round Robin Scheduling, Idle Task

UNIT-III

Embedded Firmware Design, development and Free RTOS Embedded Firmware Design Approaches, Super-loop based approach, Embedded Operating System based approach, Programming in Embedded C, Integrated development environment (IDE), Overview of IDEs for Embedded System Development. Introduction to FreeRTOS, Resources Used by FreeRTOS, Task Management, Task Functions, Task Priorities, Idle task and task hook function, Creation and Deletion of tasks.

UNIT-IV

INTER-PROCESS COMMUNICATION: Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority inversion

UNIT-V

PROCESS MANAGEMENT: Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals.

TEXT BOOKS:

- C.M. Krishna and G.Shin, Real Time Systems, McGraw-Hill International Edition, 1997.
- Jean J Labrosse, Embedded Systems Building Blocks Complete and Ready-to-use Modules in C, CMP books, 2/e, 1999.

SUGGESTED READING:

- Jean J Labrosse , Micro C/OS-II, The Real Time Kernel, CMP Books, 2011
- Sam Siewert, V, Real-Time Embedded Components and Systems: With Linux and RTOS (Engineering), 2015
- Tanenbaum, Modern Operating Systems, 3/e, Pearson Edition, 2007.
- VxWorks: Programmer's Guide 5.4, Windriver, 1999



BCE-P721
INTERNET OF THINGS

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0
PREREQUISITE: None

OBJECTIVES: The course has following objectives

- The Internet is evolving to connect people to physical things in real time. It‟s becoming the Internet of Things (IoT).
- The course enables student to understand the basics of Internet of things and protocols.
- It introduces some of the application areas where Internet of Things can be applied.
- Students will learn about the middleware for Internet of Things. To understand the concepts of Web of Things

COURSE OUTCOME: On completion of course, student will be able to:

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

IOT - What is the IoT and why is it important? Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues.

UNIT-II

IOT PROTOCOLS - Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer-Security



UNIT-III

IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

UNIT-IV

WEB OF THINGS - Web of Things versus Internet of Things – Two Pillars of the Web Architecture StandardizationforWoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals andBusiness Intelligence.

UNIT-V

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.

TEXT BOOKS:

- The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
- Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)

SUGGESTED READINGS:

- Internet of Things: Evolutions and Innovations By Nasreddine Bouhai
- Internet of Things: edited by Ovidiu Vermesan, Peter Friess
- Designing the Internet of Things By Adrian McEwen, Hakim Cassimally
- Research papers



BCE-O731
OPTIMIZATION TECHNIQUES IN COMPUTING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None

OBJECTIVES: The course has following objectives

- Introduce the fundamental concepts of Optimization Techniques;
- Make the learners aware of the importance of optimizations in real scenarios;
- Provide the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable.

COURSE OUTCOME: On completion of course, student will be able to:

- Understand the overview of optimization techniques, concepts of design space, constraint surfaces and objective function.
- Review differential calculus in finding the maxima and minima of functions of several variables.
- Formulate real-life problems with Linear Programming.
- Solve the Linear Programming models using graphical and simplex methods.
- Formulate real-life transportation, assignment and travelling salesman problems to find the optimum solution using transportation algorithms
- Analyze the Queuing model for effective customer satisfaction

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 **long t**ype questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Linear Programming : Introduction, Construction of LP Model, Graphical of Solution LP. Simplex Method, Introduction, Standard LP Form and its basic Solutions, Simplex Algorithm, Artificial Starting Solution, Special cases in Simplex Method, Applications.

UNIT II

Duality: Introduction, Definition of Dual Problems, Relationship between the Optimal Primal and Dual Solutions, Economic Interpretation of Duality, Dual Simplex Method, Primal Dual Computation.

UNIT III

Integer Programming : Methods of Integer Programming, Cutting-Plane Method: Fractional (Pure Integer) Method, Mixed-Cut method, Branch and Bound Technique. . **Deterministic Dynamic Programming :** Introduction, Recursive Nature of Computing, Forward and Backward Recursion, Applications of Dynamic Programming in Shortest Route Problem, Cargo Loading Problem, Work Force Size Model.

UNIT IV

Transportation and Assignment Model : Definition of Transportation Model, Non Traditional Transportation Model, Transportation Algorithms, Assignments Model. **Game Theory:** Minimax-Maximin criterion, Pure strategies, Mixed strategies and Expected Payoff, Concept of Dominance, Graphical Solution of m x 2 and 2 x n Games. Solution by Linear Programming method.

UNIT V

Queuing Theory : Definition of Queuing System, Characteristics of Queuing Models, Notation, Transient and Steady State of Queuing System, Birth-Death process, Pure birth & Pure Death processes, (M/M/1):(FIFO/ 8 / 8); (M/M/s):(FIFO/ 8 / 8); (M/M/1):(FIFO/N/8) Models, Their Characteristics, State Transition Diagrams.

TEXT BOOKS:

- Engineering optimization: Theory and practice-by S.S.Rao, New Age International (P) Limited.
- Operations Research: An Introduction by H A Taha, 5th Edition, Macmillan, New York.
- Operations Research by NVR Naidu, G Rajendra, T Krishna Rao, I K International Publishing house, New Delhi.

SUGGESTED READINGS:

- Taha, Hamdy A., Operations Research, (Maxwell Macmillan) 2. Kanti Swarup, P.K. Gupta, Man Mohan Operations Research, (Sultan Chand & Sons)
- Gillet, Billy E.,Introduction to Operations Research, A Computer Oriented Algorithmic Approach (TMH)



BCE-O732
PARALLEL AND DISTRIBUTED SYSTEM

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITES: Familiarity with the design and analysis of sequential algorithms, knowledge of basic computer organization and elementary operating systems concepts are required.

COURSE OBJECTIVES:
Upon completion, the student should

(a) be able to design and analyze parallel algorithms for a variety of problems and computational models
(b) be familiar with the fundamentals of the architecture, operating systems, and compilers, and their performance implications in parallel computing systems.
(c) implement parallel applications on modern parallel computing systems, and be able to measure, tune, and report on their performance.

COURSE OUTCOMES:

There are several courses on parallel and distributed computing offered in our department.

Parallel Computing is concerned with the design and implementation of scalable parallel computations, i.e., a single problem solved using multiple processors operating simultaneously to decrease time to completion. Its focus is algorithms, programming models, architectures, and performance analysis.
Distributed Systems is concerned with the provision of ongoing reliable services to geographically dispersed users. The focus is networks, server architecture, protocols, security, resiliency, and scalability.
Distributed and Concurrent Algorithms is concerned with the specification and proof of safety and liveness properties of key algorithms used in concurrent systems such as mutual exclusion. Its focus is the application of formal techniques.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction

Parallel Computing, Parallel Architecture, Architectural Classification Scheme, Performance of Parallel Computers, Performance Metrics for Processors, Parallel Programming Models, Parallel Algorithms.



UNIT-II

Pipeline Processing - Introduction, Pipeline Performance, Arithmetic Pipelines, Pipelined Instruction Processing, Pipeline Stage Design, Hazards, Dynamic Instruction Scheduling.

Synchronous Parallel Processing - Introduction, Example-SIMD Architecture and Programming Principles, SIMD Parallel Algorithms, Data Mapping and memory in array processors, Case studies of SIMD parallel Processor.

UNIT-III

Introduction to Distributed Systems - Definition, Issues, Goals, Types of distributed systems, Distributed System Models, Hardware concepts, Software Concept, Models of Middleware, Services offered by middleware, Client Server model.

Communication - Layered Protocols, Remote Procedure Call, Remote Object Invocation, Message Oriented Communication, Stream Oriented Communication

Resource and Process Management - Desirable Features of global Scheduling algorithm, Task assignment approach, Load balancing approach, load sharing approach, Introduction to process management, process migration, Threads, Virtualization, Clients, Servers, Code Migration

UNIT-IV

Synchronization - Clock Synchronization, Logical Clocks, Election Algorithms, Mutual Exclusion, Distributed Mutual Exclusion-Classification of mutual Exclusion Algorithm, Requirements of Mutual Exclusion Algorithms, Performance measure, Non-Token based Algorithms: Lamport Algorithm, Ricart–Agrawala's Algorithm, Maekawa's Algorithm.

UNIT-V

Consistency and Replication - Introduction, Data-Centric and Client-Centric Consistency Models, Replica Management. Distributed File Systems;

Introduction, good features of DFS, File models, File Accessing models, File-Caching Schemes, File Replication, Network File System (NFS), Andrew File System (AFS), Hadoop Distributed File System and Map Reduce.

TEXT BOOKS:

- A Grama, A Gupra, G Karypis, V Kumar. Introduction to Parallel Computing (2nd ed.). Addison Wesley, 2003.
- C Lin, L Snyder. Principles of Parallel Programming. USA: Addison-Wesley Publishing Company, 20 .
- J Jeffers, J Reinders. Intel Xeon Phi Coprocessor High-Performance Programming. Morgan Kaufmann Publishing and Elsevier, 2013.

SUGGESTED READINGS:

- Kai Hwang, Jack Dongarra & Geoffrey C. Fox, "Distributed and Cloud Computing: Clusters, Grids, Clouds, and the Future Internet (DCC)", 2012.
- Andrew S. Tanenbaum & Maarten van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall, 2017.



BCE-O733
AD-HOC & SENSOR NETWORKS

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None

OBJECTIVE:

- To analyse the various design issues and challenges in the layered architecture of Ad hoc wireless networks
- To compare the differences between cellular and ad hoc networks and analyse the challenges at various layers and applications
- To summarize the protocols used at the MAC layer and scheduling mechanisms
- To compare and analyse types of routing protocols used for unicast and multicast routing
- To examine the network security solution and routing mechanism
- To examine the quality of service routing in Adhoc Networks.

COURSE OUTCOME:

Upon completion of the course the student will be able to,

- Describe the unique issues in ad-hoc/sensor networks.
- Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Ad-hoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT - I

INTRODUCTION: Introduction to ad-hoc networks – definition, characteristics, features, Applications. Characteristics of wireless channel, ad-hoc mobility models: indoor and outdoor models.

UNIT - II

MEDIUM ACCESS PROTOCOLS: MAC Protocols: Design issues, goals and classification. Contention based protocols – with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT - III

NETWORK PROTOCOLS: Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, energy aware routing algorithm, hierarchical routing, QoS aware routing.

UNIT - IV

END – END DELIVERY AND SECURITY: Transport Layer: Issues in designing – Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT – V

CROSS LAYER DESIGN: Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, cross layer cautionary perspective. Integration of ad hoc with Mobile IP networks.

TEXT BOOKS:

- C. Siva Ram Murthy and B. S. Manoj, Ad hoc Wireless Networks Architecture and Protocols, 2nd edition, Pearson Edition, 2007.
- Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000.

SUGGESTED READINGS:

- Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, Mobile ad-hoc networking, Wiley-IEEE press, 2004.
- Mohammad Ilyas, The handbook of ad-hoc wireless networks, CRC press, 2002.
- T. Camp, J. Boleng, and V. Davies " A Survey of Mobility Models for Ad-hoc Network"
- Research, "Wireless Commun, and Mobile Comp.. Special Issue on Mobile Ad-hoc Networking Research, Trends and Applications, Vol. 2, no. 5, 2002, pp. 483 – 502.
- A survey of integrating IP mobility protocols and Mobile Ad-hoc networks, Fekri M.bduljalil and Shrikant K. Bodhe, IEEE communication Survey and tutorials, no: 12007.



BCE-O734
BIO MEDICAL SIGNAL PROCESSING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Basic Knowledge of Medical Background.

OBJECTIVE: This course introduces basic requirement for instrumentation of human body, data acquisition and monitoring. The student will understand various biomedical signals and image applications of ECG, EEG, EMG etc.

COURSE OUTCOME:

Upon completion of the course the student will be able to,

- develop a strong understanding of the biomedical engineering and how it can be applied for medical purpose to treat problems in diseases.
- learn to research and understand the unique needs of specific challenges in biomedical engineering.
- learn to build knowledge about different problems in biomedical engineering.
- learn to develop and test innovative ideas through a deep knowledge of biomedical engineering
- develop the willingness to take a risk and the ability to deal with failure.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction to Bio-Medical Instrumentation: Components of the man-instrumentation system, Physiological systems of the body, Problems encountered in measuring a living system, Basics of Electrocardiography, Electroencephalography & Electromyography, Transducer and transducer principles, active transducer, passive transducer, transducer for biomedical applications, Resting and active potentials, Propagation of action potentials.

UNIT II

Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field, Temperature Measurements, Principles of ultrasonic measurement, Instrumentation for Diagnostic X Rays.
Electrical safety in medical equipment: Physiological effects of electrical current, shock hazards from electrical equipment, methods of accident prevention.



UNIT III

ECG: ECG data acquisition, ECG lead system, Removal of Baseline Wander and Power Line Interferences, ECG parameters and their estimation: QRS Detection (Different Methods), Estimation of R-R Interval, ST Segment Analysis, Arrhythmia Analysis

UNIT IV

Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length Coding.

UNIT V

EEG: Neurological Signal Processing, The electrophysiological origin of brain waves, The EEG signals & characteristic, linear prediction theory, the autoregressive method, spectral error measure, Transient detection and estimation – the case of epileptic patients, Sleep EEG, markov model and markov chain, Dynamics of Sleep/Wake transition.
Course Outcome: Student will learn how to interface human body for data monitoring and acquisition. It will provide design guideline for biomedical instrumentation.

TEXT BOOKS

- Biomedical Signal Processing, Willis J Tomkin, Phi.
- Biomedical Signal Processing, D.C Reddy McGrawhill

SUGGESTED READINGS:

- Biomedical Instrumentation and Measurement.,Crommwell,Weibel and Pfeifer, PHI
- Biomedical Signal Analysis A Case Study Approach, Rangaraj M. Rangayyan, John Wiley and Sons Inc.
- Medical instrumentation Application and Design, john G. Webster, john Wiley & Sons Inc.

BCE-O735
E-COMMERCE

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None

OBJECTIVE:

- Identify and apply relevant problem solving methodologies
- Design components, systems and/or processes to meet required specifications for a web presence
- Demonstrate research skills
- Communicate effectively in ways appropriate to the discipline, audience and purpose.
- Work as an effective member or leader of diverse teams within a multi-level, multi-disciplinary and multi-cultural setting for the Group Website Research Project
- Appreciate ethical implications of professional practice

COURSE OUTCOME: Upon completion of the course the student will be able to,

- Understand the E-Commerce and E- business infrastructure and trends
- Analyze different types of portal technologies and deployment methodologies commonly used in the industry.
- Analyze the effectiveness of network computing and cloud computing policies in a multi- location organization.
- Analyze real business cases regarding their e-business strategies and transformation processes and choices.
- Integrate theoretical frameworks with business strategies.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Electronic Commerce: Frameworks, E-Commerce and Convergence, Anatomy of E-Commerce Applications, Consumer Applications, Organization Applications.
Network Infrastructure for E-Commerce: Market forces influencing, Components of I-Way,
Network Access Equipment, Global Information Distribution Network.
Internet as Network Infrastructure: Internet Terminology, History of Internet, NSFNET, National Research and Educational Network, Globalization of Academic Internet, Internet Applications.

UNIT II

E-Commerce and WWW: Architectural Framework of E-Commerce, WWW as the Architecture, Hypertext Publishing, Technology and Security of Web.
Consumer Oriented E-Commerce: Consumer Oriented Application, Mercantile Process Model, Mercantile Model from consumer and Merchant's Perspective.
Electronic Payment System: Types of EPS, Digital Token-Based EPS, Smart Cards and EPS, Credit card based EPS, Risk and EPS, Designing EPS.

UNIT III

Inter Organizational Commerce and EDI: EDI, EDI Applications in Business, EDI : Legal, Security and Privacy Issue, EDI and E-Commerce, Standardization and EDI, EDI Software implementation, EDI Envelop for Message Transport, Value Added Networks, Internet Based EDIs.
Intra Organizational E-Commerce: Internal Information System, Macro Forces and Internal Commerce, Work-Flow Automation and Coordination, Customization and Internal Commerce.

UNIT IV

Supply Chain Management: SCM Fundamentals, Managing Retail Supply Chain, Supply Chain
Application Software, Future of Supply Chain Software
E-Commerce and Banking: Changing Dynamics in Banking industry, Home Banking History and Implementation Approaches, Open Versus Closed Models, Management Issues in Online Banking.
Network Security and Firewalls: Client-Server Network Security, Emerging Client Server Security Threats, Firewalls and Network Security, Data and Message Security, Challenge Response System, Encrypted Documents and E-Mail.

UNIT V

Advertising and Marketing on the Internet: Information based Marketing, Advertising on Internet, Charting on-Line Marketing Process.
Consumer Search and Resource Discovery: Search and Resource Discovery Paradigms, Information Search and retrieval, E-Commerce Catalogs, Information Filtering, Consumer-Data Interface.
Software Agents: History, Characteristics and Properties of Software Agents, Technology behind Software Agents, Telescript Agent Language, Safe-Tcl, Applets, Browser and Software Agents.

TEXT BOOKS:

- E-Business Roadmap for Success Dr. Ravi Kalakota Marcia Robinson Addison Wesley
- Frontiers of e-commerce Ravi Kalakota Pearson.

SUGGESTED READINGS:

- Ravi Kalokaota and A.B. Whinston, Frontiers of Electronic Commerce, Addison-Wesley
- Ravi Kalokaota and A.B. Whinston, Electronic Commerce A Manager's Guide, Addison- Wesley



BCE-O736
HUMAN RESOURCE AND ORGANIZATIONAL BEHAVIOR

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None.

OBJECTIVES: The course has following objectives

- To learn the basics of Human Resource and Organizational Behavior.
- The course shall be conducted in an interactive manner since students learn best by active participation.
- To explain the use of Human Resource and Organizational Behavior in current job scenario.
- To practical knowledge of Human Resource and Organizational Behavior.
- To learn what is the use of Industrial Economics and Business Administration in practical life and business.
- Students develop basic skills for the job market.
- Lecture and discussion methods will be followed to familiarize students with the theories, concepts, techniques, etc.
- Provide an authentic opportunity for students to develop teamwork and leadership skills.

COURSE OUTCOME: On completion of course, student will be able to:

- Develop a strong understanding of the Industrial Economics and Business Administration and how it can be applied for business purpose to treat problems in diseases.
- In today's dynamic environment, where technology and capital have ceased to provide competitive advantage, it is only an organization' human resources which have become the differentiating factor for organizational success and excellence.
- OB provides perspectives and skills that enhance understanding of our own behavior and our ability to influence the behavior of others in organizational settings.
- Further, organizations must rely on effective human resource management for their long-term sustainability.
- develop the willingness to take a risk and the ability to deal with failure.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.



UNIT I

Introduction: What is Organizational Behaviour (OB) and Human Resource Management (HRM) Difference between corporates and development organizations OB and HRM and Sustainable development OB and HRM: contribution and linkages with sustainability Importance of OB and HRM for sustainable development practitioners.

UNIT II

Knowing and Managing Yourself: Individual Behaviour: MARS model of individual behaviour Values: Values across cultures (Hofstede's framework); Personality: Big five model; MBTI; Use of personality tests; Personality attributes influencing OB Emotions: Understanding emotions; Emotional labour; Emotional Intelligence Attitudes: Attitudes v/s values; Job Satisfaction.

UNIT III

Motivation in the workplace: What is motivation; Early theories of motivation; Contemporary theories of motivation; Designing motivating jobs: JCM model; motivation of social workers.

UNIT IV

Communication: What is communication; Organizational communication: Formal networks and Grapevine; Electronic communications; Barriers to effective communication; non- verbal communication; Improving Interpersonal. communication: Empathy and Active listening

UNIT V

Leadership: Difference between managers and leaders; Perspectives of leadership: Trait, Behavioural, Contingency; Inspirational leadership: Transactional, Transformational, Charismatic; NGO leadership

Job Analysis: Job description; Job Specification; Job Evaluation.

TEXT BOOKS*:*

- Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2009
- McShane: Organizational Behaviour, 3e, TMH, 2008
- Nelson: Organizational Behaviour, 3/e, Thomson, 2008.
- Newstrom W. John & Davis Keith, Organisational Behaviour-- Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.

SUGGESTED READINGS:

- McShane, S.L. and Von Glinow, M.A., Organizational Behaviour, New Delhi, Tata McGraw-Hill Publishing company ltd.
- P. Jyothi, P. and Venkatesh, D.N., Human Resource Management, New Delhi, Oxford University Press.
- Denhardt, R.B., Denhardt, J.V., and Aristigueta, M.P. (2009), Managing Human Behaviour in Public and Non-Profit Organizations, Second edition. California, Sage Publications.
- Pynes, J.E. (2004). Human Resources Management for Public and Nonprofit Organizations, Second Edition. San Francisco, CA: Jossey- Bass Publishers.



BCE-O737
SOFT COMPUTING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Strong Knowledge of Mathematics, Algorithmic concept, Understanding of Programming and basic problem-solving skills.

OBJECTIVES: The course has following objectives

- To understand Soft Computing concepts, technologies, and applications.
- To understand the underlying principle of soft computing with its usage in various applications.
- To understand different soft computing tools to solve real life problems.
- To understand basic Fuzzy System and Genetic Algorithms and their use cases.

COURSE OUTCOME: On completion of course, student will be able to:

- To get a glimpse of Fuzzy logic and its applications.
- Understand Artificial neural networks and its applications.
- Solve single-objective optimization problems using GAs.
- Develop applications on different soft computing techniques like Fuzzy, GA and Neural networks.
- Implement Neuro-Fuzzy and Neuro-Fuzz-GA expert systems.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Overview of Soft Computing, Difference between Soft and Hard computing, Requirement and components of Soft computing including Artificial intelligence systems Neural networks, fuzzy logic, genetic algorithms, Artificial neural networks Vs Biological neural networks, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT- II

Introduction and how brain works, Neuron as a simple computing element, Introduction of Neural Network, Learning rules and various activation functions, Single layer Perceptron, Back Propagation networks, Architecture of Backpropagation (BP) Networks, Backpropagation Learning, Introduction to Early ANN architectures (basics only)-McCulloch & Pitts model, Perceptron, Adaline, Madaline.



UNIT – III

Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map, Hebbian Learning, Competitive learning, Introduction to Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Classification.

UNIT- IV

History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Boltzmann, tournament, rank, and steady state selections, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.
Applications of GA and Introduction to genetic programming- basic concepts.

UNIT – V

GA based Weight Determination, K - factor determination in Columns. Fuzzy BP Architecture, Learning in Fuzzy BP, Application of Fuzzy BP Networks, Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

TEXT BOOKS:

- Fuzzy Logic: A Pratical approach, F. Martin, , Mc neill, and Ellen Thro, AP Professional, 2000.
- Foundations of Neural Networks, Fuzzy Systems, and Knowldge Engineering, Nikola K. Kasabov, MIT Press, 1998.
- Soft Computing, D. K. Pratihar, Narosa, 2008.

SUGGESTED READINGS:

- Fuzzy Logic with Engineering Applications (3rd Edn.), Timothy J. Ross, Willey, 2010.
- An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 2000.
- Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.
- Neural Networks, Fuzzy Logis and Genetic Algorithms: Synthesis, and Applications, S. Rajasekaran, and G. A. Vijayalakshmi Pai, Prentice Hall of India, 2007.



BCE-O738
STORAGE MANAGEMENT

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None

OBJECTIVES: The course has following objectives

- To understand the basic components of Storage System Environment.
- To understand the Storage Area Network Characteristics and Components.
- To describe the different backup and recovery topologies and their role in providing disaster recovery and business continuity capabilities.
- To understand the local and remote replication technologies.

COURSE OUTCOME: On completion of course, student will be able to:

- Understand the logical and physical components of a Storage infrastructure.
- Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.
- Understand the various forms and types of Storage Virtualization.
- Describe the different role in providing disaster recovery and business continuity capabilities.
- Distinguish different remote replication technologies.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction to Storage Technology: Data proliferation, evolution of various storage technologies, Overview of storage infrastructure components, Information Lifecycle Management, Data categorization.

UNIT II

Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components,properties, performance, and specifications, RAID levels & parity algorithms, hot sparing, Front end to host storage provisioning, mapping and operation.



UNIT III

Introduction to Networked Storage: JBOD, DAS, NAS, SAN & CAS evolution and comparison.
Applications, Elements, connectivity, standards, management, security and limitations of DAS, NAS, CAS & SAN.

UNIT IV

Hybrid Storage solutions; Virtualization: Memory, network, server, storage & appliances. Data center concepts & requirements, Backup & Disaster Recovery: Principles Managing & Monitoring: Industry management standards (SNMP, SMI-S, CIM), standard framework applications, Key management metrics (Thresholds, availability, capacity, security, performance).

UNIT V

Information storage on cloud :Concept of Cloud, Cloud Computing, storage on Cloud, Cloud Vocabulary, Architectural Framework, Cloud benefits, Cloud computing Evolution, Applications & services on cloud, Cloud service providers and Models, Essential characteristics of cloud computing, Cloud Security and integration.

TEXT BOOKS:

- Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein; Storage Network explained : Basic and application of fiber channels, SAN, NAS, iSESI, INFINIBAND and FCOE, Wiley India.
- John W. Rittinghouse and James F. Ransome; Cloud Computing : Implementation , Management and Security, CRC Press, Taylor Frances Pub.

SUGGESTED READINGS:

- Nick Antonopoulos, Lee Gillam; Cloud Computing : Principles, System & Application, Springer.
- Anthony T. Velete, Toby J.Velk, and Robert Eltenpeter, Cloud Computing : A practical approach,TMH Pub.
- Saurabh , Cloud Computing : Insight into New Era Infrastructure, Wiley India.
- Sosinsky, Cloud Computing Bible, Wiley India.
- Rich Schiesser, IT Systems Management :Designing, Implementing and Managing World-classInfrastructures, PHI Learning



BCE-O739
QUANTUM COMPUTING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Strong Knowledge of Physics & Mathematics and Basic Algorithmic Concept.

OBJECTIVES: The course has following objectives

- To introduce the fundamentals of quantum computing.
- The problem solving approach using finite dimensional mathematics.
- Explain the key principles of the various models of quantum computation.

COURSE OUTCOME: On completion of course, student will learn:

- Basics of complex vector spaces.
- Architecture and algorithms.
- Quantum mechanics as applied in Quantum computing.
- Fundamentals of Quantum computations.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction to Quantum Computation: Qubits versus classical bits, spin-half systems and photon polarizations, Bloch sphere representation of a qubit, multiple qubits. Foundations of quantum theory. States, observables, measurement and unitary evolution, Pure and mixed states, density matrices.

UNIT- II

Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

UNIT – III

Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum Circuits. Deutsch's Algorithm, Simon's periodicity algorithm, Grover's search algorithm.

UNIT- IV

Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem.

UNIT – V

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search.

TEXT BOOKS:

- Paul Kaye, Raymond Laflamme, and Michele Mosca, An Introduction to Quantum Computing, Oxford University Press (2007).
- Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press.

SUGGESTED READINGS:

- Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific.
- Pittenger A. O., An Introduction to Quantum Computing Algorithms.
- Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008.



BCE-O740
COMPUTER VISION

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Basic Knowledge of probability & linear algebra and basic programming & algorithmic Concept.

OBJECTIVES:

The course has following objectives

- To introduce the fundamentals of computer vision.
- Basic principles of image formation, image processing algorithms and different algorithms for 3D reconstruction and recognition from single or multiple images (video).
- Real world use cases of computer vision.

COURSE OUTCOME

On completion of course, student will learn:

- Understand key features of Computer Vision to analyse and interpret the visible world around us.
- Design and implement multidimensional signal processing, feature extraction, pattern analysis, visual geometric modelling, and stochastic optimization.
- Apply the computer vision concepts to Real World Problems (Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering etc.).

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Cameras – lenses, projections, sensors, Radiometry –Measuring Light, light and surfaces Representation – color spaces, Camera model and Camera calibration, Binocular imaging systems, Sources, Shadows and Shading.



UNIT- II

2D/3D Vision: Filters, Binary Images, Features, Edge Detection, Texture, Shape, Segmentation, Clustering, Model Fitting, Probabilistic, 3D Vision: Multiview geometry, Stereo, Shape from X,3D data.

UNIT – III

Image Processing and Feature Extraction: Image representations (continuous and discrete), Linear Filters, Texture, Edge detection. Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

UNIT- IV

Shape Representation and Segmentation: Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis.

UNIT – V

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component analysis, Shape priors for recognition.

TEXT BOOKS:

- Computer Vision: A Modern Approach by D. A. Forsyth and J. Ponce, Prentice Hall, 2003.
- Computer Vision by Linda Shapiro and George Stockman, Prentice-Hall, 2001.

SUGGESTED READINGS:

- Robot Vision, by B. K. P. Horn, McGraw-Hill. 1986.
- Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.



BCE-O741
AI IN HEALTHCARE

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: Basic Knowledge of probability & linear algebra and basic programming & algorithmic Concept.

OBJECTIVES:

The course has following objectives

- Understand models of human and artificial intelligence, specifically computational models of Intelligence.
- Comprehend a collection of machine learning models (identified and covered in the course), and their applications in medicine and healthcare.
- Analyze the performance of specific models as applied to biomedical problems, and justify their use and limitations.

COURSE OUTCOME

- On completion of course, student will learn:
- Determine the factors involved in decision support that can improve business performance across the provider/payer ecosystem.
- Identify differences in methods and techniques in order to appropriately apply to pain points using case studies.
- Critically assess the opportunities to leverage decision support in adapting to trends in the industry.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and students shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and students shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT-I

Introduction to AI in Healthcare, Why AI is needed in Healthcare, Examples of AI in Healthcare and Growth of AI in Healthcare, Operationalizing Consumerism Using AI, Operationalizing a New Supply Chain, Machine Learning, Artificial Intelligence and Decision Support.

UNIT- II

Review of relevant mathematical and statistical concepts: logarithmic loss, cross entropy optimizing cost functions; linear and logistic regression. Forms of Learning: supervised, semi-supervised, unsupervised, active, and transfer learning.



UNIT – III

Supervised Learning: Decision trees, non-parametric methods for learning, support vector machines, Bio-inspired learning (from perceptron to deep learning): neural basis of computing, classical neural networks, deep neural networks, deep belief networks, recurrent neural networks, and convolutional neural networks. Unsupervised Learning: basic and advanced clustering techniques, dimensionality reduction (feature selection and feature extraction)

UNIT- IV

Knowledge Representation and Reasoning: Prepositional logic, first-order logic, ontological engineering and probabilistic reasoning, Time-series analysis: temporal models (probabilistic reasoning over time).

UNIT – V

Unique characteristics and challenges in medicine and healthcare; History and status quo of intelligent and expert systems in medicine. Risk stratification, patient outcome prediction, disease progression modeling, Clinical decision-making and intelligent systems to support evidence-based medicine, Phenotype and clinical/bio-marker discovery, Relevance to personalized medicine. Analysis of tissue morphology and other medical imaging applications

TEXT BOOKS:

- Prashant Natarajan, John C. Frenzel, and Detlev H. Smaltz, Demystifying Big Data and Machine Learning for Healthcare (1 ed.), CRC Press, 2017. ISBN 9781138032637.
- Arjun Panesar, Machine Learning and AI for Healthcare: Big Data for Improved Health Outcomes (1 ed.), Apress, 2019. ISBN 978-1484237984.

SUGGESTED READINGS:

- Raghupathi W, Raghupathi V., Big data analytics in healthcare: promise and potential, Health info science and syst.,2014.
- Chen Y, Argentinis E, et al., Clinical therapeutics, IBM Watson: how cognitive computing can be applied to big data challenges in life sciences research. 2016.
- Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
- Stuart Russell and Peter Norvig. 2009. Artificial Intelligence: A Modern Approach (3rd ed.). Prentice Hall Press, Upper Saddle River, NJ, USA.
- Toby Segaran. 2007. Programming Collective Intelligence (First ed.). O'Reilly.



BCE-O742
NEURAL NETWORK AND DEEP LEARNING

MM : 100 **Sessional : 30**
Time : 3 hrs **ESE : 70**
L T P **Credits 3**
3 0 0

PREREQUISITE: None.

OBJECTIVES: Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.

COURSE OUTCOME: On completion of course, student will be able to:

- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

NOTE: The question paper shall consist of two sections A and B. Section A contains 10 short type questions of 6 marks each and student shall be required to attempt any five questions. Section B contains 8 long type questions of ten marks each and student shall be required to attempt any four questions. Questions shall be uniformly distributed from the entire syllabus.

UNIT I

Introduction: What is a neural network, Supervised Learning with Neural Networks, What is Deep Learning, Why is Deep Learning taking off.

UNIT II

Neural Networks Basics: Binary Classification, Logistic Regression, Logistic Regression Cost Function, Gradient Descent, Derivatives. Computation graph, Derivatives with a Computation Graph, Logistic Regression Gradient Descent, Gradient Descent on m Example, Vectorization, Vectorising Logistic Regression, Vectorising Logistic Regression's Gradient Output, Broadcasting in Python

UNIT III

Shallow neural networks: Neural Networks Overview, Neural Network Representation, Computing a Neural Network's Output, Vectorizing across multiple examples, Explanation for Vectorized Implementation, Activation functions, Why do you need non-linear activation functions?, Derivatives of activation functions, Gradient descent for Neural Networks, Backpropagation intuition (optional), Random Initialization

UNIT IV

Deep Neural Networks: Deep L-layer neural network, Forward Propagation in a Deep Network, Getting your matrix dimensions right, Why deep representations?, Building blocks of deep neural networks, Forward and Backward Propagation, Parameters vs Hyper parameters

UNIT V

Case Study: Learning from Scientist: Geoffrey Hinton, Pieter Abbeel, Ian Goodfellow, Yuanqing Lin, etc

TEXT BOOKS:

- CharuC.Aggarwal "Neural Networks and Deep learning" Springer International Publishing, 2018
- Satish Kumar, "Neural Networks, A Classroom Approach", Tata McGraw -Hill, 2007.
- Simon Haykin, "Neural Networks, A Comprehensive Foundation", 2nd Edition, Addison Wesley Longman, 2001.

SUGGESTED READINGS:

- Bishop, Christopher M. Pattern Recognition and Machine Learning. Springer, 2006
- Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000.

BCE-P861
MAJOR PROJECT WITH RESEARCH PAPER

MM: 400 **SESSIONAL: 100**
TIME: 8HR **ESE: 300**
L T P

0 0 16 **CREDITS: 09**

COURSE OUTCOME:

1. Students will get knowledge of problem identification and use their skills for team building and project development.
2. develop a solution for any real world problem.
3. Students will get equipped with knowledge of latest/upcoming problems and solutions.
4. Students will also be able to improve skills for project planning, implementation and communication.

COURSE OBJECTIVE:

1. Study and identify the problem area by studying and reviewing research papers.
2. Implement the skills of software engineering and software project management.
3. Improve upon the communication and presentation skills.

Each student shall be assigned a Major Project by departmental committee. The student is required to perform his project work under the supervision of the supervisor(s). There shall be a presentation on the project work of the student to be evaluated by a departmental committee chaired by H.O.D. The student is required to submit his project report along with a research paper in the form of dissertation 15 days before the end of VIII semester. The student is required to submit three copies of the project work with a certificate from the supervisor(s) that the work is an authentic record of the work performed by him. The report shall be forwarded by H.O.D. The report of the project work shall be evaluated by the external examiner(s). The same external examiner(s) shall hold the viva-voce examination.

** - Marks for the project work shall be awarded jointly by the external and internal examiners after viva-voce examination.
*** - There shall be a seminar on the project work of the student to be evaluated by the Departmental committee chaired by H.O.D.

TEXTBOOKS/LEARNING RESOURCES:

- Ford, Neal, Matthew McCullough and Nathaniel Schutta, Presentation patterns:Techniques for crafting better presentations (1 ed.), Addison- Wesley, 2012. ISBN 978-0321820808.