Department of Information Technology (In-house)
Syllabus of Bachelor of Computer Application (BCA)
(Effective from academic session 2019-20)

Semester-2

Name of the Course: BCA **Subject:** Computer Architecture & Computer Architecture lab	
Course Code: BCA201 + BCA291	**Semester: 2nd**
Duration: 36 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4 hrs./week	Continuous Assessment: 25
Credit: 3 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To be able to understand the functionality,organization and implementation of computer system.
2	To gain Skill to recognize the instruction codes and formats.
3	Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.

Objective:	
Sl. No.	
1	To enable the students to understand the functionality and implementation of computer system.
2	To familiarize with the various instruction codes and formats of different CPUs.
3	To introduce the students to I/O and memory organization of computer system
4	To deliver an overview of Control Unit of a computer system
5	To learn the usage of parallel and vector processing.

Pre-Requisite:	
Sl. No.	

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Data Representation:** Number Systems – decimal, binary, octal, hexadecimal, alphanumeric representation, 2. Complements – 1's complement, 2' complement, 9's complement, 10' complement, [r-1]'s complement, r's complement, 3. Fixed point representation – Integer representation, arithmetic addition, arithmetic subtraction,	**4**	**5**

	overflow, decimal fixed point representation, 4. Floating point representation, 5. IEEE 754 floating point representation		
02	**Computer arithmetic:** Addition algorithm of sign magnitude numbers, Subtraction algorithm of sign magnitude numbers, Addition algorithm of signed 2's complement data, Subtraction algorithm of signed 2's complement data, Multiplication algorithm, Booth's algorithm, Division algorithm	**5**	**5**
03	**Register transfer and micro-operations:** Register transfer language, Register transfer, Bus system for registers, Memory transfers – memory read, memory write, Micro operations – register transfer micro operations, arithmetic micro operations, logic micro operations, shift micro operations, Binary adder, binary adder subtractor, binary incrementer, arithmetic circuit for arithmetic micro operations, One stage logic circuit,Selective set, Selective complement, Selective clear, Mask, Insert, Clear	**5**	**5**
04	**Basic Computer organization and design:** Instruction codes, Direct address, Indirect address & Effective address, List of basic computer registers, Computer instructions: memory reference, register reference & input – output instructions,Block diagram & brief idea of control unit of basic computer, 6. Instruction cycle	**4**	**5**
05	**Micro programmed control:** Control memory, Address sequencing,Micro program examples	**2**	**5**
06	**Central processing unit:** General register organization,Stack organization, Register stack, Memory stack, Stack operations – push & pop, Evaluation of arithmetic expression using stack, Instruction format, Types of CPU organization [single accumulator, general register & stack organization] & example of their instructions, 6. Three, two, one & zero address instruction, 7. Definition and example of data transfer, data manipulation & program control instructions, 8. Basic idea of different types of interrupts [external, internal & software interrupts], 9. Difference between RISC & CISC	**5**	**5**
07	**Pipeline and vector processing:** Parallel processing, Flynn's classification, Pipelining, Example of pipeline, space time diagram, speedup, Basic idea of arithmetic pipeline, example of floating point addition/ subtraction using pipeline	**3**	**10**
08	**Input – output organization:** Peripheral devices,Input – output interface, Isolated I/O, Memory mapped I/O, Asynchronous data transfer: strobe & handshaking, Programmed I/O, Interrupt initiated I/O, Basic idea of DMA & DMAC 8. Input – output processor	**4**	**10**
09	**Memory organization:** Memory hierarchy, Main memory definition, types of main memory, types of RAM, ROM, difference between SRAM & DRAM, Cache memory, Cache memory mapping – Direct, Associative, Set Associative, CAM, hardware organization of	**4**	**20**

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	CAM, Virtual memory, mapping using pages, page fault, mapping using segments, TLB, Auxiliary memory, diagrammatic representation of magnetic disk & hard disk drive, Definitions of seek time, rotational delay, access time, transfer time, latency		
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Practical
Course Code: BCA291
Credit: 2
Skills to be developed:
Intellectual skills:

1. Ability to understand the functionality,organization and implementation of computer system.
2. Skill to recognize the instruction codes and formats.
3. Knowledge of the internal working of main memory, cache memory, associative memory and various modes of data transfer.
4. Familiarization with the working of parallel processing and vector processing

List of Practical:

1. Basic gates and Universal gates. Implementation of Half & full adder. Half & full subtractor,
2. 4 bit logical unit, 4 bit arithmetic unit, BCD adder, 4 bit adder/ subtractor, Carry look ahead adder, Design of ALU for multi bit operation, comparators.
3. 8:1 MUX IC verification, 16:1 MUX using IC 74151, dual 2 to 4 Decoder/ Demultiplexer IC evaluation. Priority encoder.
4. Read/ write operation using RAM IC, Cascading RAM ICs

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
M. Morris Mano	Computer System Architecture		PEARSON
William Stallings	Computer Organization & Architecture – Designing For Performance		PEARSON
J.P. Hayes	Computer Architecture & Organisation		TATA MCGRAW HILL
Reference Books:			
T. K. Ghosh	Computer Organization and Architecture		TATA MCGRAW-HILL
Behrooz Parhami	Computer Architecture		OXFORD UNIVERSITY PRESS

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List of equipment/apparatus for laboratory experiments:

Sl. No.	
1.	
2.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	**Unit**	**Objective Questions** (MCQ only with the correct answer)		**Subjective Questions**			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**				
B	**1 to 9**			**5**	**3**	**5**	**70**
C	**1 to 9**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	**Chapter**	**Marks of each question**	**Question to be set**	**Question to be answered**
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

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Name of the Course: BCA **Subject:** Data Structures with Python & Data Structure with Python Lab	
Course Code: BCA202 + BCA292	**Semester: 2nd**
Duration: 36 Hours	**Maximum Marks: 100 + 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 4 hrs./week	Continuous Assessment: 25
Credit: 3 + 2	Practical Sessional internal continuous evaluation: 40
	Practical Sessional external examination: 60

Aim:	
Sl. No.	
1	To build skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2	To gain knowledge of advanced abstract data type (ADT) and data structures and their implementations.
3	To be able to implement algorithms to perform various operations on data structures.

Objective:	
Sl. No.	
1	To familiarize the students with data structures used for representing data in memorylike Arrays, Linked Lists, Graphs, Trees etc.
2	To analyze the performance of algorithms**.**
3	To learn how to apply algorithms of data structures on data.
4	To gain knowledge of various methods used in data structures such as brute force, divide and conquer etc.

Pre-Requisite:	
Sl. No.	
1.	Basic knowledge of mathematics.
2.	Basic Knowledge of programming.

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction to Data Structure**	**1**	**0**
02	**Arrays** 1D, 2D and Multi-dimensional Arrays, Sparse Matrices.Polynomial representation (Polynomial Representation as Application).	**3**	**7**
03	**Linked Lists** Singly, Doubly and Circular Lists, Normal and Circular representation of Self Organizing Lists, Skip Lists, Polynomial representation (Polynomial Representation as	**4**	**8**

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	Application).		
04	**Stacks** Implementing single / multiple stack/s in an Array, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another, Applications of stack, Limitations of Array representation of stack	**4**	**5**
05	**Queues** Array and Linked representation of Queue, Circular Queue, De-queue, Priority Queues	**4**	**5**
06	**Recursion** Developing Recursive Definition of Simple Problems and their implementation, Advantages and Limitations of Recursion, Understanding what goes behind Recursion (Internal Stack Implementation)	**4**	**10**
07	**Trees** Introduction to Tree as a data structure, Binary Trees (Insertion, Deletion, Recursive and Iterative Traversals of Binary Search Trees), Threaded Binary Trees (Insertion, Deletion, Traversals), Height-Balanced Trees (Various operations on AVL Trees).	**5**	**10**
08	**Searching and Sorting** Linear Search, Binary Search, Comparison of Linear and Binary Search, Selection Sort, Insertion Sort, Merge Sort, Quick sort, Shell Sort, Comparison of Sorting Techniques	**6**	**15**
09	**Hashing** Introduction to Hashing, Deleting from Hash Table, Efficiency of Rehash Methods, Hash Table Reordering, Resolving collision by Open Addressing, Coalesced Hashing, Separate Chaining, Dynamic and Extendible Hashing, Choosing a Hash Function, Perfect Hashing Function.	**5**	**10**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		
	Total:		

Practical
Course Code: BCA292
Credit: 2
Skills to be developed:
Intellectual skills:

1. Skill to analyze algorithms and to determine algorithm correctness and their time efficiency.
2. Knowledge of advanced abstract data type (ADT) and data structures and their implementations.
3. Ability to implement algorithms to perform various operations on data structures.

List of Practical:

1. Implementation of array operations.
2. Stacks and Queues: adding, deleting elements .
3. Circular Queue: Adding & deleting elements

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4. Merging Problem : Evaluation of expressions operations on Multiple stacks & queues
5. Implementation of linked lists: inserting, deleting, inverting a linked list.
6. Implementation of stacks & queues using linked lists:
7. Polynomial addition, Polynomial multiplication
8. Sparse Matrices : Multiplication, addition.
9. Recursive and Non Recursive traversal of Trees Threaded binary tree traversal.AVL tree implementation Application of Trees.
10. Application of sorting and searching algorithms Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Ellis Horowitz, SartajSahni, Susan AndersonFreed	Fundamentals of Data Structures in C		Silicon Pr
Richard F. Gilberg and Behrouz A. Forouzan	Data Structures: A Pseudocode Approach with C		Cengage Learning
Noel Kalicharan	Data Structures In C		CreateSpace Independent Publishing Platform
Reference Books:			
Adam Drozdek	Data Structures and algorithm in C		Cengage Learning
SartajSahni	Data Structures, Algorithms and applications in C++	2nd Edition	Universities Press

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	Python 2.7 or higher and other softwares as required.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 9**	**10**	**10**				

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B **C**	**1 to 9** **1 to 9**			**5** **5**	**3** **3**	**5** **15**	**70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	

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Name of the Course: BCA **Subject:** Advanced Mathematical Computation			
Course Code: BCA203		**Semester: 2nd**	
Duration: 40 Hours		**Maximum Marks: 100**	
Teaching Scheme		**Examination Scheme**	
Theory: 3 hrs./week		End Semester Exam: 70	
Tutorial: 1 hrs./week		Attendance : 5	
Practical: 0		Continuous Assessment: 25	
Credit: 4		Practical Sessional internal continuous evaluation:	
		Practical Sessional external examination:	
1	To develop formal reasoning.		
2	Create habit of raising questions		
3	Knowledge regarding the use of Mathematics in Computer Science		
4	Ability to communicate knowledge, capabilities and skills related to the computer engineer profession		
Objective:			
Sl. No.			
1	To understand and solve mathematical problems		
2	To impart knowledge regarding relevant topics .		
3	To familiarize students with linear Algebra, differential and integral calculus, sequence and series.		
Pre-Requisite:			
Sl. No.	Basic mathematical foundations.		
Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Algebra** Abstract Algebra: Sets, Algebra of sets and their applications, Relations, Mapping, Compositions, Groups, Abelian groups, Sub-groups, Cyclic groups, Notion of ring and fields. Complex numbers, Modulus and amplitudes, De Moivre's theorem Polynomials, Division algorithm, Fundamental theorem of classical algebra [statement only], Descart's rule of sign, Relation between roots and coefficients, symmetric function of the roots, transformation of polynomial equations, Binomial equations	**20**	**25**
02	**Differential Equations** Order, degree, formation of a differential equation, Solutions of ODE, First order and first degree: Variable separation method, Homogeneous equations, Exact equations, Condition of	**14**	**25**

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	exactness [statement only], Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree, Clairaut's equation, second order linear ODE with constant coefficients, Solutions using D operator method. Cauchy-Euler equations and their solutions		
03	**Sequence and Series** Bounded and unbounded sequences, convergence or divergence of a sequence, behaviour of monotone sequences, algebra of convergent sequences, Cauchy's sequence, Cauchy's general principle of convergence, infinite series – its convergence and sum, series with positive terms and standard tests of convergence [without proof], alternating series, Leibnitz test, absolute convergence.	**6**	**20**
	Sub Total:	**40**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Assignments:
Based on the curriculum as covered by subject teacher.

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
S. K. Mapa	Higher Algebra		Levant Books
Chakravorty and Ghosh	Advanced Higher Algebra		U N Dhar Pvt. Ltd

Reference Books:

Sheplay L Ross	Differential Equations		Wiley
Das and Mukherjee	Differential Calculus		U N Dhar Pvt. Ltd

List of equipment/apparatus for laboratory experiments:

Sl. No.	

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the	Subjective Questions

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		correct answer)					
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 3**	**10**	**10**				
B	**1 to 3**			**5**	**3**	**5**	**70**
C	**1 to 3**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

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Name of the Course: BCA **Subject:** Software Engineering	
Course Code: BCA204	**Semester: 2nd**
Duration: 36 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 3 hrs./week	End Semester Exam: 70
Tutorial: 1 hrs./week	Attendance : 5
Practical:	Continuous Assessment: 25
Credit: 4	Practical Sessional internal continuous evaluation:
	Practical Sessional external examination:

Aim:	
Sl. No.	
1	Familiarization with the concept of software engineering and its relevance.
2	Understanding of various methods or models for developing a software product.
3	Ability to analyze existing system to gather requirements for proposed system.
4	Gain skill to design and develop softwares.

Objective:	
Sl. No.	
1	To introduce the students to a branch of study associated with the development of a software product.
2	To gain basic knowledge about the pre-requisites for planning a software project.
3	To learn how to design of software
4	To enable the students to perform testing of a software.

Pre-Requisite:	
Sl. No.	
1.	None

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	Overview of Computer Based Information System- TPS, OAS, MIS, DSS, KBS Development Life Cycles- SDLC and its phases Models- Waterfall, Prototype, Spiral, Evolutionary Requirement Analysis and Specification, SRS System analysis- DFD, Data Modeling with ERD	**12**	**20**
02	Feasibility Analysis System design tools- data dictionary, structure chart, decision table, decision tree. Concept of User Interface, Essence of UML. CASE tool.	**7**	**15**
03	Testing- Test case, Test suit, Types of testing- unit testing, system testing, integration testing, acceptance testing Design methodologies: top down and bottom up approach, stub, driver, black box and white box testing.	**7**	**20**

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04	ERP, MRP, CRM, Software maintenance SCM, concept of standards [ISO and CMM]	**10**	**15**
	Sub Total:	**36**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		
	Total:		

Assignments:

Based on the curriculum as covered by subject teacher.

List of Books

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Igor Hawryszkiewycz	System analysis and design		PEARSON
V Rajaraman	Analysis and design of Information System		PHI
Ian Sommerville	Software Engineering		Addison-Wesley

Reference Books:

List of equipment/apparatus for laboratory experiments:

Sl. No.	
1	Computer with moderate configuration
2	MS-Project or similar software.

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 4**	**10**	**10**				
B	**1 to 4**			**5**	**3**	**5**	**70**
C	**1 to 4**			**5**	**3**	**15**	

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each	Question to be	Question to be

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		question	set	answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:			
Practical Internal Sessional Continuous Evaluation			
Internal Examination:			
Five No of Experiments			
External Examination: Examiner-			
Signed Lab Note Book(for five experiments)	**5*2=10**		
On Spot Experiment(one for each group consisting 5 students)	**10**		
Viva voce	**5**		

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Name of the Course: BCA **Subject:** Environmental Science	
Course Code: BCA205	**Semester: 2nd**
Duration: 12 Hours	**Maximum Marks: 100**
Teaching Scheme	**Examination Scheme**
Theory: 1 hr./week	End Semester Exam: 70
Tutorial: 0	Attendance : 5
Practical: 0	Continuous Assessment: 25
Credit: 1	Practical Sessional internal continuous evaluation:
	Practical Sessional external examination:

Aim:	
Sl. No.	
1	To enable critical thinking in relation to environmental affairs.
2	Understanding about interdisciplinary nature of environmental issues
3	Independent research regarding environmental problems in form of project report
4	Understand social interactions by which human behave and cultural values that underlay behaviors.

Objective:	
Sl. No.	
1	To create awareness about environmental issues.
2	To nurture the curiosity of students particularly in relation to natural environment.
3	To develop an attitude among students to actively participate in all the activities regarding environment protection
4	To develop an attitude among students to actively participate in all the activities regarding environment protection

Pre-Requisite:	
Sl. No.	
	None

Contents		**Hrs./week**	
Chapter	**Name of the Topic**	**Hours**	**Marks**
01	**Introduction** Introduction to environment and ecology Components of the environment, environmental degradation, natural cycles of environment.	**2**	**10**
02	**Ecology** Elements of Ecology, Ecological balance, Effects of Aforestation and deforestation.	**2**	**10**
03	**Air Pollution and Control** Atmospheric composition, Segments of atmosphere climate, weather, Atmospheric Stability, dispersion of pollutants , Sources and effects of air pollutants, primary and secondary pollutants**,** Criteria Pollutants:PM10, Source, Effect, Control , CO, NO x, **Source, Effect,** Control , SO x, Source, Effect,	**2**	**10**

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	Control ,Lead, Ozone, Source, Effect, Control , Green house effect, Control Measures ,Depletion of ozone layer, Effects of UV exposer, Control Measures		
04	**Water Pollution and Control** Hydrosphere, natural water resources and reserves, Pollutants: their origin and effects ,COD and BOD test, NBOD and CBOD , River / lake / ground water pollution , Control Measures of water pollution , Drinking water and waste water treatment	**2**	**15**
05	**Land Pollution** Lithosphere, pollutants [municipal, industrial, commercial, agricultural, hazardous solid wastes] their origin and effects , Collection and disposal of solid waste, recycling and treatment methods	**2**	**15**
06	**Noise Pollution** Sources, effects, standards and control	**2**	**10**
	Sub Total:	**12**	**70**
	Internal Assessment Examination & Preparation of Semester Examination		**30**
	Total:		**100**

Assignments:

List of Books
Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher

Reference Books:

End Semester Examination Scheme. Maximum Marks-70. Time allotted-3hrs.

Group	Unit	Objective Questions (MCQ only with the correct answer)		Subjective Questions			
		No of question to be set	Total Marks	No of question to be set	To answer	Marks per question	Total Marks
A	**1 to 6**	**10**	**10**				

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B **C**	**1 to 6** **1 to 6**			**5** **5**	**3** **3**	**5** **15**	**70**

- Only multiple choice type question (MCQ) with one correct answer are to be set in the objective part.
- Specific instruction to the students to maintain the order in answering objective questions should be given on top of the question paper.

Examination Scheme for end semester examination:

Group	Chapter	Marks of each question	Question to be set	Question to be answered
A	**All**	**1**	**10**	**10**
B	**All**	**5**	**5**	**3**
C	**All**	**15**	**5**	**3**

Examination Scheme for Practical Sessional examination:

Practical Internal Sessional Continuous Evaluation

Internal Examination:

Five No of Experiments			

External Examination: Examiner-

Signed Lab Note Book(for five experiments)	**5*2=10**	
On Spot Experiment(one for each group consisting 5 students)	**10**	
Viva voce	**5**	