MANIPAL UNIVERSITY JAIPUR

Department of Computer Applications
Manipal University Jaipur
BCA Course Handout-(2020-21)

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Computer Applications, SBS

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PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES
Bachelor of Computer Application

PROGRAM OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.

[PSO.2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[PSO.3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications

Course Hand-out

MATHEMATICS-I | MA1102 | 4 Credits | 3 1 0 4

Session: Nov 01 – Jan 30

Faculty: Dr. Garima Agarwal

A. **Introduction:** This course is offered by Dept. of Computer Application, targeting students who wish to pursue research & development in industries or higher studies. The aim of the department of Computer Application is to produce highly, well qualified and motivated graduates possessing fundamental knowledge of Computer Application and research of software who can provide leadership and service to our nation and world. The main focus of the department of Computer Application is to be recognized as a trendsetter of its undergraduate programme through focus on core competencies, multidisciplinary collaborations, and quality in education. This course provides the fundamentals of mathematical functions, limit and continuity. Differentiation and integration is also included in this course. Student will be able to understand the concept of maxima and minima of the function along with its application in real life.

B. **Course Outcomes:** At the end of the course, students will be able to
[1102.1]. To understand the concept of mathematical functions, Limit, Continuity and its properties.
[1102.2]. To understand the concept of special functions.
[1102.3]. To understand the differentiability and its application.
[1102.4]. To understand the concept of maxima and minima of the function and its applications.
[1102.5]. To understand the concept of integration and its applications.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

PROGRAM OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

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PROGRAM SPECIFIC OUTCOMES

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

A. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

B. SYLLABUS

Function: Definition, domain and range of function, types of functions (into, onto, one to one), composite function. **Limit:** Definition, first principle, properties, and simple problems related to limit. Some standard limits. **Continuity**: Definition, continuity of sum, product, difference and quotient of two continuous functions, simple problems. **Special Functions:** Trigonometric functions and their properties, exponential functions, logarithmic functions, hyperbolic functions, inverse circular functions and related properties, simple problems. Rational functions, partial fraction and simple problems. **Differentiation**: Definition, differentiation of simple functions using first principle, differentiation of trigonometric functions and inverse circular functions, method of substitution, differentiation of product and quotient of functions, maxima and minima of a function of single variable. **Integration:** Definition, integration of simple functions using substitution, integration of trigonometric and inverse circular functions and related problems, integration by parts, integration of rational functions. Definite integral and their properties, simple problems. Reduction formula and simple problems.

C. TEXT BOOKS

1. Shanti Narayan, "*Differential calculus*", S. Chand & Co, Delhi, 2012.
2. Shanti Narayan, "*Integral calculus*", S. Chand & Co, Delhi, 2012.
3. M.D. Raisinghania, et.al, "*Differential calculus*", Delhi, 2010.

D. REFERENCE BOOKS

1. Das Mukherjee, *"Integral Calculus"*, U.N. Dhur, 1977.
2. N. Piskunov, *"Differential and integral calculus"*, Vol I & Vol II, CBS, 2000.

E.   **Lecture Plan:**

S.No	Major Topic	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of assessing COs
1.	FUNCTION, LIMIT, CONTINUITY	Introduction and course handout briefing	Understand POS, PSO and COS	Lecture	NA	NA
2.		Definition of Function	Introduce Function	Lecture	1102.1	Mid Term I quiz and end term
3.		Type of functions	Understand Functions	Lecture	1102.1	Mid Term I quiz and end term
4.		Domain and co domain of the function	Lean range of Functions	Lecture	1102.1	Mid Term I quiz and end term
5.		Illustrative examples	Practice Questions	Lecture	1102.1	Mid Term I quiz and end term
6.		Mapping of funtions	Implementation of Functions	Lecture	1102.1	Mid Term I quiz and end term
7.		Illustrative examples	Practice Questions	Lecture	1102.1	Mid Term I quiz and end term
8.		Definition of Limit	Understand Limit	Lecture	1102.1	Mid Term I quiz and end term
9.		Properties of limit	Lean Limit	Lecture	1102.1	Mid Term I quiz and end term
10.		Illustrative examples	Practice Questions	Lecture	1102.1	Mid Term I quiz and end term
11.		Some standard Limit	Understanding of limits	Lecture	1102.1	Mid Term I quiz and end term
12.		Illustrative examples	Practice Questions	Lecture	1102.1	Mid Term I quiz and end term
13.		Definition of Continuity	Introduce Continuity	Lecture	1102.1	Mid Term I quiz and end term
14.		Properties of Continuity	Understanding Continuity	Lecture	1102.1	Mid Term I quiz and end term
15.		Illustrative examples	Practice Questions	Lecture	1102.1	Mid Term I quiz and end term
16.		Tutorial	Tutorial	Activity	1102.1	Mid Term I quiz and end term
17.	SPECIAL FUNCTIONS	Introduction of Trigonometric functions	Introduce Trigonometric functions	Lecture	1102.2	Mid Term I quiz and end term
18.		Properties of Trigonometric functions	Understanding Trigonometric functions	Lecture	1102.2	Mid Term I quiz and end term

19.		Illustrative examples	Practice Questions	Lecture	1102.2	Mid Term I quiz and end term
20.		exponential functions and its propertied	Introduce exponential functions	Lecture	1102.2	Mid Term I quiz and end term
21.		Illustrative examples	Practice Questions	Lecture	1102.2	Mid Term I quiz and end term
22.		logarithmic functions and its properties	Introduce logarithmic functions	Lecture	1102.2	Mid Term I quiz and end term
23.		Illustrative examples	Practice Questions	Lecture	1102.2	Mid Term I quiz and end term
24.		hyperbolic functions	Introduce hyperbolic functions	Lecture	1102.2	Mid Term I quiz and end term
25.		Properties of hyperbolic functions	Learn hyperbolic functions	Lecture	1102.2	Mid Term I quiz and end term
26.		Illustrative examples	Practice Questions	Lecture	1102.2	Mid Term I quiz and end term
27.		inverse circular functions	Introduce inverse circular functions	Lecture	1102.2	Mid Term I quiz and end term
28.		Illustrative examples	Practice Questions	Lecture	1102.2	Mid Term I quiz and end term
29.		Rational and partial fractions	Learn Rational and partial fractions	Lecture	1102.2	Mid Term I quiz and end term
30.		Illustrative examples	Practice Questions	Lecture	1102.2	Mid Term I quiz and end term
31.		Tutorial	Tutorial	Activity	1102.2	Mid Term I quiz and end term
32.	DIFFERENTIATION	Definition	Introduce Definition	Lecture	1102.3	Mid Term II quiz and end term
33.		Differentiation of different functions	learn Definition	Lecture	1102.3	Mid Term II quiz and end term
34.		Illustrative examples	Practice Questions	Lecture	1102.3	Mid Term II quiz and end term
35.		Illustrative examples	Practice Questions	Lecture	1102.3	Mid Term II quiz and end term
36.		First principal of Differentiation	Implementing Differentiation	Lecture	1102.3	Mid Term II quiz and end term
37.		Illustrative examples	Practice Questions	Lecture	1102.3	Mid Term II quiz and end term

38.		Methods of Differentiation	Learn Differentiation	Lecture	1102.3	Mid Term II quiz and end term
39.		Illustrative examples	Practice Questions	Lecture	1102.3	Mid Term II quiz and end term
40.		Tutorial	Tutorial	Activity	1102.3	Mid Term I quiz and end term
41.	MAXIMA AND MINIMA	Definition and basic concept	Introduce maxima and minima	Lecture	1102.4	Mid Term II quiz and end term
42.		Application of maxima and minima	Implementation of maxima and minima	Lecture	1102.4	Mid Term II quiz and end term
43.		Illustrative examples	Practice Questions	Lecture	1102.4	Mid Term II quiz and end term
44.		Illustrative examples	Practice Questions	Lecture	1102.4	Mid Term II quiz and end term
45.		Tutorial	Tutorial	Activity	1102.4	Mid Term I quiz and end term
46.	INTEGRATION	Definition	Introduce integration	Lecture	1102.5	quiz and end term
47.		Methods of integration	Learn integration	Lecture	1102.5	quiz and end term
48.		Illustrative examples	Practice Questions	Lecture	1102.5	quiz and end term
49.		Integration of various functions	Understand integration	Lecture	1102.5	quiz and end term
50.		Reduction formula	Understand integration	Lecture	1102.5	quiz and end term
51.		Illustrative examples	Practice Questions	Lecture	1102.5	quiz and end term
52.		Tutorial	Tutorial	Activity	1102.5	Mid Term I quiz and end term

F.   Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA 1102.1	To understand the concept of mathematical functions, Limit, Continuity and its properties.	1					3							1		
MA 1102.2	To understand the concept of special functions.		1		1										1	
MA 1102.3	To understand the differentiability and its application.		2		3			1						1		
MA 1102.4	To understand the concept of maxima and minima of the function and its applications.	1				2	1									1
MA 11025	To understand the concept of integration and its applications.		3		1										1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

G.   Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA 1102.1	To understand the concept of mathematical functions, Limit, Continuity and its properties.															
MA 1102.2	To understand the concept of special functions.															
MA 1102.3	To understand the differentiability and its application.															
MA 1102.4	To understand the concept of maxima and minima of the function and its applications.															
MA 11025	To understand the concept of integration and its applications.															

0- No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR
School of Basic Sciences

Department of Computer Applications

Course Hand-out

COMPUTER FUNDAMENTALS| CA 1101 | 4 Credits | 3 1 0 4

Session: July 2020 – November-2020| Faculty: Dr. Linesh Raja | Class: Department Core Course

A. **Introduction:** The present era is evolving around computing devices. The one who is lacking the knowledge of computing devices is considered as illiterate. There for this course is targeted to bring awareness and knowledge of various computing devices and accessories. The main objectives of the course are as follows:

- Identify the main system elements of a computer system and describe their function.
- Describe the main hardware components of a Personal Computer.
- Describe the main software elements of a computer system.
- Introduction to Operation Systems.

B. **Course Outcomes:** At the end of the course, students will be able to

CO1: CA1101.1 To understand basic elements of the computer system and to bring awareness about their functionality.

CO2:CA1101.2 To understand the hardware component of computer and its basic function for skill development.

CO3: CA1101.3 To describe the main Software category and its utility.

CO4: CA1101.4 To Understand the types and function of Operating System.

CO5: CA1101.5 To understand the programming languages: Machine Language, Assembly language, High level language. Assembler, Compilers and Interpreter.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

PROGRAM OUTCOMES

PO.1: Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO.2: Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

PO.3: Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

PO.4: Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO.5: Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

PO.6: Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO.7: Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

PROGRAM SPECIFIC OUTCOMES

PSO.1: Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO.2: Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO.3: Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Written Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E.   SYLLABUS

Introduction: Basic Definitions, Data, information, bits, byte, software, hardware, memory, Characteristics of a computer. Block diagram of a computer. Generation of Computers, Types of Computers, Memory and its types, Input Devices, Output Devices, Monitors Characteristics, Digital and Analog signals. Video Standard: VGA, SVGA, Types of printer, Storage Devices: Primary Vs Secondary memory, Storage Fundamentals, Data Storage and Retrieval Methods, Various Storage Devices. Types of software: System Software, Application Software. Operating Systems: types and functions. Programming Languages: Machine Language, Assembly language, High level language. Assembler, Compilers and Interpreter. Introduction to MS-Office.

F.   TEXT BOOKS
1. S.K. Basanadra, Computers Today, Galgotia Publications, (1e) 2010.
2. P.K. Sinha, P. Sinha, Computer Fundamentals, (6e), BPB Publications, 2007.
3. A. Leo, M. Leon, Introduction to Computers, (1e), Vikas Publishing House, 2009.

G.   Lecture Plan:

Lec No	Major Topics	Topic	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Computer Fundamentals	Basic Definitions	Introduction e of Computer	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term
2		Data, information, bits, byte	Understand the Knowledge of Memory Size	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
3		Software and Hardware	Understand the difference between Hardware and Software	Lecture & Discussion	1101.2	In Class Quiz Mid Term I End Term
4		Characteristics of a computer	Understand Characteristics of a computer	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
5		Generation of Computers	Understand Generation of Computers	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term
6-7		Types of Computers	Compare the different types of computers	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term
8-9	Input Devices, Output Devices	Input Devices, Output Devices	Understand difference between Input Devices, Output Devices	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
10		Monitors Characteristics	Understand Monitors Characteristics	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
11		Digital and Analog signals	Compare the Digital and Analog signals	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term

12		Video Standard: VGA, SVGA	Understand the Video Standard: VGA, SVGA	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term
13		Types of printer	Understand and Compare Types of printer	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term
14		Memory and its types	Understand Memory and its types	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
15		Primary Vs Secondary memory	Compare Primary Vs Secondary memory	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
16	**Computer Memory**	Storage Fundamentals	Understand the Storage Fundamentals	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
17		Data Storage and Retrieval Methods, .	Basic mechanism Data Storage and Retrieval	Lecture & Discussion	1101.1 1101.2	In Class Quiz Mid Term I End Term
18		Various Storage Devices	Understand the Various Storage Devices	Lecture & Discussion	1101.1	In Class Quiz Mid Term I End Term
19-20	**Operating Systems**	Types of software System Software, Application Software	Understand the types of software and differentiate the System Software, Application Software	Lecture & Discussion	1101.3 1101.4	In Class Quiz Mid Term II End Term
21-24		Operating Systems: types Batch Operating System, Multi-Tasking/Time-sharing Operating systems	Understand the types of software	Lecture & Discussion	1101.4	In Class Quiz Mid Term II End Term

25		Real time and Distributed Operating System	Understand Real time and Distributed Operating System	Lecture & Discussion	1101.4	In Class Quiz Mid Term II End Term
26		Network Operating System, Mobile Operating System	Understand the Network Operating System, Mobile Operating System	Lecture & Discussion	1101.4	In Class Quiz Mid Term II End Term
27		Operating Systems: functions	Understand the Operating Systems: functions	Lecture & Discussion	1101.4	In Class Quiz Mid Term II End Term
28-32		Booting, Memory Management Execution, Data Security Disk Management Process Management Process Scheduling	Understand the Booting, Memory Management Execution, Data Security Disk Management Process Management And Process Scheduling	Lecture & Discussion	1101.1 1101.4	In Class Quiz Mid Term II End Term
33-37		Process Synchronizations Device Management	Understand the Process Synchronizations and Device Management	Lecture & Discussion	1101.4	In Class Quiz Mid Term II End Term
38-41	**Programming Languages**	Programming Languages: Machine Language, Assembly language, High level language, Assembler Compilers and Interpreter	Understand the Programming Languages: Machine Language, Assembly language, High level language, Assembler, Compilers and Interpreter	Lecture & Discussion	1101.5	In Class Quiz Mid Term II
42-43	**Introduction to MS-Office**	MS-Word-Introduction Use of File, Home, insert tab in word Use of Design, Layout, Reference tab in word, Use of Mailing, Review, View tab in word	Understand the use of MS office, use of Home, insert tab in word, use of Design, Layout, Reference tab in word, use of Mailing, Review, View tab in word	Lecture & Discussion	1101.3	In Class Quiz End Term II

44-45		MS-Excel-Introduction Use of File, Home Insert tab in Excel Use of Page Layout, Formulas, Data, Review, View in Excel Use of Different Chart and Preparation of Charts	Understand the use of MS-Excel, use of File, Home Insert tab in Excel use of Page Layout, Formulas, Data, Review, View in Excel, use of Different Chart and Preparation of Charts	Lecture & Discussion	1101.3	In Class Quiz End Term
46-48		Use of File, Home, Insert, Design tab in Power Point, Use of Transition, Animation, Slide Show, tab in PowerPoints, Use of Review, View tab in PowerPoints, how to make effective PowerPoint presentation	Understand the use of File, Home, Insert, Design tab in Power Point Use of Transition, Animation, Slide Show, tab in PowerPoints Understand the use of Review, View tab in PowerPoints, make effective PowerPoint presentation	Lecture & Discussion	1101.3	In Class Quiz End Term

H. **Course Articulation Matrix: (Mapping of COs with POs)**

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		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1101.1	To understand basic elements of the computer system and to bring awareness about their functionality.	2	0	0	0	0	0	1	0	0	0
CA 1101.2	To understand the hardware component of computer and its basic function	0	0	0	0	0	1	0	0	0	0
CA 1101.3	To describe the main Software category and its utility	0	1	0	1	0	0	0	1	0	0
CA 1101.4	To Understand the types and function of Operating System.	0	0	1	0	1	0	0	0	1	0
CA 1101.5	To understand the programming languages: Machine Language, Assembly language, High level language. Assembler, Compilers and Interpreter.	0	0	0	1	0	0	0	0	0	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

I 0 4

Session: Jul 20 – Dec 20 | Faculty: Pradeep Kumar | Class: BCA I semester

A. Introduction: The main objective of this course is to obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of complex digital electronic circuits.

B. Course Outcomes: After completion of this course student will be able to

[CA1102.1] Be able to manipulate numeric information in different forms, e.g. different bases, signed Integers, various codes such as ASCII, Gray, and BCD.

[CA1102.2] Apply the principles of Boolean algebra to manipulate and minimize logic expressions.

[CA1102.3] Design two-level logic functions with AND, OR, NAND, NOR and XOR gates with minimum Number of gate delays or literals.

[CA1102.4] Be able to design and Analyze small combinational circuits and use standard combinational functions / building blocks to build larger more complex circuits.

[CA1102.5] Be able to design and Analyze small sequential circuits and devices and to use standard sequential Functions/building blocks to build larger more complex circuits.

Program Outcomes:

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Program Specific Outcomes

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Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

Introduction: Number system, Boolean Algebra, De-Morgan's law, simplification of Boolean algebra, **Logic Gates:** basic and universal gates, simplification method: K-map and tabulation method. **Combination circuit:** introduction to combinational circuit, half adder circuit, full adder circuit, half subtracted, full subtracted, binary parallel adder, carry propagation, magnitude comparator, decoder, encoder, multiplexer, de-multiplexer circuit, design of code converter, parity bit generator and checker. **Sequential circuit:** Introduction to flip flop. **Types of flip flop:** S-R, D, J-K, T, Clocked flip flop. S-R latch, Master-Slave flip flop, realization of one flip flop using other flip flop. Counter and **shift registers:** Synchronous counters, asynchronous counter, ring counter, serial-in-parallel out, parallel-in-serial out, parallel-in-parallel out, bidirectional shift registers.

E. TEXT BOOKS

1. *S. Salivahanan, S. Pravin Kumar, "Digital Circuits and Design", Vikas Publishing House Pvt. Ltd.*

2. *2012Morris Mano, "Digital Logic and Computer Design", PHI, 2015.*

F. REFERENCE BOOKS

1. *Bartee, "Digital Computer Fundamentals", Tata McGraw Hill, 2004.*

2. *Taub and Schilling, "Digital Integrated Electronics", McGraw Hill International Edition, 2005.*

3. *Thomos L. Floyd, "Digital Fundamentals", Universal Book Stall, 2003.*

G. Lecture Plan:

Lectures	Major Topics	Topics	Session outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Introduction**	Number System: Binary, Decimal, Octal ,Hexadecimal	Knowledge of number system	Lecture	CA1102.1	Mid Term I, Assignment/Quiz & End Term
2.		1's and 2's Complements	Knowledge of vaious complement methods	Lecture	CA1102.1	Mid Term I, Assignment/Quiz & End Term
3.		Binary Coded Decimal (BCD),Gray Code	Knowledge of compute codes	Lecture	CA1102.1	Mid Term I, Assignment/Quiz & End Term
4.		Tutorial	Analysis of number system	Practice	CA1102.1	Mid Term I, Assignment/Quiz & End Term
5.	**Boolean Algebra**	Introduction, Development of Boolean Algebra	Analysis of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
6.		Boolean Logic Operation: Logical AND, Logical OR and Logical Complementation(Inversion)	Applications of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
7.		Boolean Addition, Boolean Multiplication, Properties of Boolean Algebra and Principle of Duality.	Applications of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
8.		Tutorial	Evaluation of Boolean algebra	Activity	CA1102.2	Mid Term I, Assignment/Quiz & End Term
9.		Demorgan's Theorems, inimization of Boolean expression using algebraic method	Applications of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
10.	**Simplification Methods**	Sum of Products and Product of Sums : Minterm, Maxterm	Synthesis of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
11.		Deriving Sum of Products (SOP) Expressions from a Truth Table, Deriving Product of Sum (POS) Expressions from a Truth Table	Applications of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
12.		Tutorial	Synthesis of Boolean algebra	Activity	CA1102.2	Mid Term I, Assignment/Quiz & End Term
13.		Karnaugh Map :Two-variable map, Three-variable map	Synthesis of Boolean	Lecture	CA1102.2	Mid Term I, Assignment/Quiz

			algebra			& End Term
14.		Four-variable map	Synthesis of Boolean algebra	Lecture	CA1102.2	Mid Term I, Assignment/Quiz & End Term
15.	**Logic Gates**	Logic Gates: OR, AND, NOT, NAND, NOR	Knowledge of logical gates	Lecture	CA1102.3	Mid Term I, Assignment/Quiz & End Term
16.		Tutorial	Knowledge of logical gates	Activity	CA1102.3	Mid Term I, Assignment/Quiz & End Term
17.		Universal Gates: Realisation of logic function using NAND gates	Knowledge of logical gates	Lecture	CA1102.3	Mid Term I, Assignment/Quiz & End Term
18.		Realisation of logic function using NOR gates	Knowledge of logical gates	Lecture	CA1102.3	Mid Term I, Assignment/Quiz & End Term
19.		Exclusive-OR (Ex-OR) Gate, Exclusive-NOR (Ex-NOR) Gate	Knowledge of logical gates	Lecture	CA1102.3	Mid Term I, Assignment/Quiz & End Term
20.		Tutorial	Knowledge of logical gates	Practice	CA1102.3	Mid Term I, Assignment/Quiz & End Term
21.	**Combination circuit**	Arithmetic Circuits: Half Adder, Full Adder , K-Map Simplification	Synthesis logical circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
22.		Half Subtractor , Full Subtractor	Synthesis logical circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
23.		4-bit Parallel Adder/Subtractor	Synthesis logical circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
24.		Tutorial	Synthesis logical circuit	Activity	CA1102.4	Mid Term II, Assignment/Quiz & End Term
25.		Fast Adder	Synthesis logical circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
26.		BCD Adder	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
27.		Combinational Circuits: Multiplexers – Basic Four input Multiplexer	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
28.		Tutorial	Application of combinational	Flipped class	CA1102.4	Mid Term II, Assignment/Quiz

		circuit				& End Term
29.		Implementation of Boolean Expression using Multiplexers	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
30.		Demultiplexers : 1-to-4 Demultiplexer, 1-to-8 Demultiplexer,	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
31.		Decoders: Basic Binary Decoder, 3-to-8 Decoder	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
32.		Tutorial	Application of combinational circuit	Activity	CA1102.4	Mid Term II, Assignment/Quiz & End Term
33.		4-to-16 Decoder	Synthesis combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
34.		Encoders: Octal-to-Binary,Encoder, Decimal-to-BCD Encoder	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
35.		Code Converters: BCD-to-Binary Converters	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
36.		Tutorial	Synthesis combinational circuit	Flipped class	CA1102.4	Mid Term II, Assignment/Quiz & End Term
37.		Binary-to-Gray Code Converters, Gray Code-to-Binary Converters	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
38.		parity bit generator and checker	Application of combinational circuit	Lecture	CA1102.4	Mid Term II, Assignment/Quiz & End Term
39.	**Sequential circuit**	Flip-Flops: Latches	Knowledge of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
40.		Tutorial	Knowledge of sequential circuit	Activity	CA1102.5	Assignment/Quiz & End Term
41.		S-R Flip-Flop, D Flip-Flop	Analysis of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
42.		J-K Flip-Flop, T Flip-Flop	Analysis of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
43.		Triggering of Flip-Flop: Level Triggering,Edge triggering	Analysis of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term

		Tutorial	Synthesis sequential circuit	Flipped class	CA1102.5	Assignment/Quiz & End Term
44.		Tutorial	Synthesis sequential circuit	Flipped class	CA1102.5	Assignment/Quiz & End Term
45.		Master Slave Flip-Flop	Synthesis sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
46.		Realisation of One Flip-Flop using other Flip-Flops.	Synthesis sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
47.	**Counter and shift registers**	Design of Synchronous Counters	Applications of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
48.		Tutorial	Applications of sequential circuit	Practice	CA1102.5	Assignment/Quiz & End Term
49.		Design of Synchronous Counters	Synthesis sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
50.		Ring Counter	Applications of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
51.		Serial-in-parallel out shift registers	Applications of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
52.		parallel-in-serial out shift registers	Applications of sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term
53.		bidirectional shift registers.	Synthesis sequential circuit	Lecture	CA1102.5	Assignment/Quiz & End Term

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
		CORRELATION WITH PROGRAM OUTCOMES														
CA1102.1	Be able to manipulate numeric information in different forms, e.g. different bases, signed Integers, various codes such as ASCII, Gray, and BCD.	1		1												
CA1102.2	Apply the principles of Boolean algebra to manipulate and minimize logic expressions.	2	1												1	
CA1102.3	Design two-level logic functions with AND, OR, NAND, NOR and XOR gates with minimum Number of gate delays or literals.	3	1					2						2	1	
CA1102.4	Be able to design and Analyze small combinational circuits and use standard combinational functions /building blocks to build larger more complex circuits	2		1		1	1	2						3	2	2
CA1102.5	Be able to design and Analyze small sequential circuits and devices and to use standard sequential Functions/building blocks to build larger more complex circuits.	2				1	1	2						3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

C Programming| CA 1103 | 4 Credits | 3 1 0 4

Session: August – December

Faculty: Mrs.Kuntal Gaur

Class: B.C.A

A.   **Introduction:** The objectives of the course can be grouped into two categories. The first one relates to understanding the basics of C Programming. The second objective is to increase the logical abilities of the students so that they can develop their own logics to solve problems using computer. The course will be taught with the help of GCC compiler.

The main objective of the course are as follows:
- Get knowledge about the basic concept of writing a program.
- Role of token (constants, variables, identifiers, operators, data type) and other building blocks of C Language.
- Use of conditional statements and looping statements to solve problems associated with decision making and repetitions.
- Concept of Array (1D, and 2D) and pointers dealing with memory management.
- Concept of Functions involving the idea of re-usability and modularity.
- Used defined data type : Structures and unions through which can be derived from basic data type
- Programming using GCC compiler in Linux.

B.   **Course Outcomes:** At the end of the course, students will be able to

[CA1103.1]. Design flow chart, write algorithm and pseudo code parallel with Control Statements to understand

flow of program execution.

[CA1103.2]. Use branching control statements and iterative control statements.

[CA1103.3]. Demonstrate the concepts of Reusability using functions.

[CA1103.4]. Understand various categorization of operators into arithmetic, logical, relational, bitwise etc.

[CA1103.5]. Debug the programs of any logical or syntactical errors to enhance problem solving skills.

[CA1103.6]. Analyse the problem statement and decide their own logic to solve the problem using C

Programming to improve employability.

C.   **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

PROGRAM OUTCOMES

[PO.1].   Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2].   Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

[PO.3].   Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.

[PSO.2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[PSO.3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

D.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	
	Sessional Exam II (Open Book)	
	In class Quizzes	
End Term Exam (Summative)	End Term Exam (open Book)	
	Total	
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E.   SYLLABUS

Introduction to Computers: Block diagram of a computer, Introduction to operating system; Number System; Algorithms and Flowcharts: Algorithmic notations; Space and Time complexity; **C Fundamentals**: C program structure, Simple I/O operations; **Operators and Expressions**: Operator precedence and associativity, bitwise operators, arithmetic expressions, evaluation of expressions; **Flow of Control**: Statements and blocks, switch–case statement, looping constructs; **Arrays**: arrays- Declaration Initialization, sorting; **Strings**: String operations on strings, built-in string handling functions, programs on strings; **Functions**: Modular programming, function declaration, definition and function call, Types of functions, function returning more values, function with operators, function and Decision Statements, function and loop operators, function with Arrays

F.   TEXT BOOKS

E.Balaguruswamy, "Computing Fundamentals & C Programming", TataMcGraw Hill, 2008.

G.   REFERENCE BOOKS
1.   B. A. Forouzan & R. F. Gilberg "Computer Science – A structured programming Approach Using C", 2011
2.   E.Balaguruswamy, *Programming in ANSI"* Tata McGraw Hill, 2011.

H. Lecture Plan:

Lectures	Major Topics	Topics	Session Outcome	Mode of delivery	Corresponding CO	Mode Of Assessing CO
1.	**Introduction to Computers (1-7 Lecture)**	Introduction and Course Hand-out briefing	Understand Cos, POs and PSOs	POWERPOINT PRESENTATION	NA	
2.		Block diagram of a computer, Introduction to operating system	Learn basics of Computers	POWERPOINT PRESENTATION	1103.1	Mid Term I, Quiz & End Term
3.		Number System	Understand Number system	Lecture	1103.1	Mid Term I, Quiz & End Term
4.		Algorithms and Flowcharts	Lean to basics of algorithms and flowcharts	POWERPOINT PRESENTATION	1103.1	Mid Term I, Quiz & End Term
5.		Algorithmic notations	Write algorithms and flowcharts	POWERPOINT PRESENTATION	1103.1	Mid Term I, Quiz & End Term
6.		Space and Time complexity	Understand notion of complexity	POWERPOINT PRESENTATION	1103.1	Mid Term I, Quiz & End Term
7.		Tutorial	Tutorial	Activity	1103.1	Mid Term I, Quiz & End
8.	**C Fundamentals (8-12 Lecture)**	C program structure	Basic of C program	POWERPOINT	1103.1	Mid Term I, Quiz & End
9.		Simple I/O operations	Learn I/O statements	POWERPOINT PRESENTATION	1103.1	Mid Term I, Quiz & End Term
10.		I/O examples	Learn I/O statements	POWERPOINT PRESENTATION	1103.1	Mid Term I, Quiz & End Term
11.		Various data types in C	Understand data types	POWERPOINT	1103.1	Mid Term I, Quiz & End
12.		Tutorial	Tutorial	POWERPOINT	1103.1	Mid Term I, Quiz & End
13.	**Operators and Expressions (13-19 Lecture)**	Types of operators	Learn types of Operators	POWERPOINT PRESENTATION	1103.4	Mid Term I, Quiz & End Term
14.		Types of operators	Learn types of Operators	POWERPOINT PRESENTATION	1103.4	Mid Term I, Quiz & End Term
15.		Examples of operators	Activity	POWERPOINT	1103.4	Mid Term I, Quiz & End
16.		Tutorial	Tutorial	Activity	1103.4	Mid Term I, Quiz & End
17.		precedence and associativity expressions	Understand sequence of evaluation	POWERPOINT PRESENTATION	1103.4	Mid Term I, Quiz & End Term
18.		evaluation of expressions	Understand evaluation of expression	Lecture	1103.4	Mid Term I, Quiz & End Term
19.		Tutorial	Tutorial	Activity	1103.4	Mid Term I, Quiz & End
20.	**Flow of**	Statements and blocks,	Blocks-if, elseif	Lecture	1103.2&1103.5	Mid Term I, Quiz & End Term

		switch–case statement	Switch case	Lecture	1103.2&1103.5	Mid Term I, Quiz & End
21.	**Control (20-29**					
22.	**lecture)**	Tutorial	Tutorial	Activity	1103.2&1103.5	Mid Term I, Quiz & End
23.		While- loop	while	Lecture	1103.2&1103.5	Mid Term I, Quiz & End
24.		Examples of While -loop	Tutorial	Activity	1103.2&1103.5	Mid Term I, Quiz & End
25.		For -loop	For loop	Lecture	1103.2&1103.5	Mid Term I, Quiz & End
26.		Examples of For-Loop	Tutorial	Activity	1103.2&1103.5	Mid Term I, Quiz & End
27.		Do-while loop	Exit controlled loop	Lecture	1103.2&1103.5	Mid Term I, Quiz & End
28.		Examples of Do-while loop	Tutorial	Activity	1103.2&1103.5	Mid Term I, Quiz & End
29.		Tutorial	Tutorial	Activity	1103.2&1103.5	Mid Term I, Quiz & End
30.		Introduction of arrays, Declaring Arrays	Basics of Array	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
31.		Reading and Displaying arrays	Reading Array	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
32.		Examples	Tutorial	Flipped Class	1103.5 & 1103.6	Mid Term II, Quiz & End
33.		Bubble Sorting	Bubble sort	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
34.	**Arrays (30-39**	Insertion Sorting	Sorting	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
35.	**lecture)**	Selection Sorting	Sorting	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
36.		Matrix declaration	2D arrays	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
37.		Matrix reading and displaying	2 D arrays	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
38.		Examples	Tutorial	Flipped class	1103.5 & 1103.6	Mid Term II, Quiz & End
39.		Tutorial	Tutorial	Activity	1103.5 & 1103.6	Mid Term II, Quiz & End
40.	**Strings (40-43**	operations on strings	Learn about Strings	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
41.	**Lecture)**	built-in string handling functions	Sting Functions	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
42.		Programs based on string operations	String based program	Lecture	1103.5 & 1103.6	Mid Term II, Quiz & End
43.		Tutorial	Tutorial	Activity	1103.5 & 1103.6	Mid Term II, Quiz & End
44.		Introduction of Modular Programming and functions	Intro to Modular Programming	Lecture	1103.3 & 1103.6	Mid Term II, Quiz & End Term
45.		Function declaration, Definition and function call	Learn basics of functions	Lecture	1103.3 & 1103.6	Mid Term II, Quiz & End Term
46.	**Functions (44-52**	Types of Functions	Functions in detail	Lecture	1103.3 & 1103.6	Mid Term II, Quiz & End
47.	**lecture)**	Function returning value	Function	Lecture	1103.3 & 1103.6	Quiz & End Term
48.		Function with operators	Function	Lecture	1103.3 & 1103.6	Quiz & End Term
49.		Function and Decision Statements	Function	Lecture	1103.3 & 1103.6	Quiz & End Term
50.		Function and loop operators	Function	Lecture	1103.3 & 1103.6	Quiz & End Term
51.		Function with Arrays	Function	Lecture	1103.3 & 1103.6	Quiz & End Term
52.		Tutorial	Tutorial	Activity	1103.3 & 1103.6	Quiz & End Term

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications
Course Hand-out

Technical Communication | LN1108 | 2 Credits | [2 0 0 2]

Session: July 19 – Dec 19 | Faculty: Dr Arun Dev Pareek | Class: BCA I Semester

A.   Introduction: This course is offered by Department of Languages as a core course to the students of BCA in 1st Semester. The course offers an in depth knowledge of Language and grammar skills as an important branch of English language studies. It covers basic concepts such as properties of Communication Skills, word formation, Grammar, Comprehension and Composition. There is no specific prerequisite on the part of students as the course begins with the very basics of the field of study.

B.   Course Outcomes: At the end of the course, students will be able to

[LN1108.1]: Interpret the basic principles and importance of effective communication.
[LN1108.2]: Develop vocabulary for communicative competence.
[LN1108.3]: Analyse and acquire knowledge of essential grammar.
[LN1108.4]: Improve ideas with precision and coherence in making formal written communication to enhance employability skills.
[LN1108.5]: Recognize the importance of speaking skills through debates and discussions.

C.   PROGRAM OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

PROGRAM SPECIFIC OUTCOMES

[PSO1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

[PSO2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems

[PSO3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	MTE I (Closed Book)	20
	MTE II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Student who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Communication: Definition, Process, Principles, General and technical communication, Modes of communication, Importance of technical communication; Barriers to Communication; **Vocabulary:** Word formation, Affixes, Compound words, Synonyms, Antonyms, Homophones and Homonyms, Misspelt words; **Grammar:** Punctuations, Parts of speech, Active and passive voice, Direct and indirect speech, Concord, Common errors; **Effective Writing:** Précis writing, Letter types, Memos, E-Mails, Circulars, Press Releases, Newsletters, Notices, Statement of Purpose, Resume writing; **Art of Public Speaking**: Tips for effective presentations; **Group discussion.**

F. Reference Books:

1. A Koneru, *"Professional Communication*", Tata McGraw Hill, 2017.
2. L Sen, "*Communication Skills*", New Delhi: Prentice Hall, 2007.
3. L. C. Bovee and J. V. Thill, *"Business Communication Today",* 13th Edition, Pearson Education, 2015.
4. M Raman and S Sharma, *"Technical Communication: Principles and Practice 2/e"*, Oxford University Press, 2015.
5. N Krishnaswamy, *"Modern English: A Book of Grammar Usage and Composition, New Delhi"*, Macmillan India, 2009.
6. R V Lesikar and M E Flatley, *"Basic Business Communication: Skills for Empowering the Internet Generation"*, Tata McGraw-Hill, 2014.
7. V K Jain and O P Biyani, *"Business Communication",* S. Chand, 2007.

G. Lecture Plan:

Lec No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear the teacher's expectation and understand the students' expectations	Lecture	NA	NA
2	**Communication:** Definition, Process	Interpret the basic principles and importance of effective communication	Lecture & discussion	LN1108.1	Mid Term I End Term
3	Principles of communication	Interpret the basic principles and importance of effective communication	Lecture & discussion	LN1108.1	Mid Term I End Term
4	General and technical communication	Interpret the basic principles and importance of effective communication	Lecture & discussion	LN1108.1	Mid Term I End Term
5	Modes of communication	Interpret the basic principles and importance of effective communication	Lecture & discussion	LN1108.1	Mid Term I End Term
6	Importance of technical communication	Interpret the basic principles and importance of effective communication	Lecture & discussion	LN1108.1	Mid Term I End Term
7	Barriers to Communication	Interpret the basic principles and importance of effective communication	Lecture	LN1108.1	Mid Term I End Term
8	**Vocabulary:** Word formation, Affixes, Compound words	Develop vocabulary for communicative competence	Lecture	LN1108.2	Mid Term I End Term
9	Synonyms, Antonyms	Develop vocabulary for communicative competence	Lecture	LN1108.2	Mid Term I End Term
10	Homophones and Homonyms, Misspelt words	Develop vocabulary for communicative competence	Lecture	LN1108.2	Mid Term I End Term
11	**Grammar:** Punctuations	Analyse and acquire knowledge of essential grammar	Lecture	LN1108.3	Mid Term I End Term
12	Parts of speech	Analyse and acquire knowledge of essential grammar	Lecture	LN1108.3	Mid Term I End Term
13	Active and passive voice	Analyse and acquire knowledge of essential grammar	Lecture	LN1108.3	Mid Term I End Term
14	Direct and indirect speech	Analyse and acquire knowledge of essential grammar	Lecture	LN1108.3	Mid Term I End Term
15	Concord	Analyse and acquire knowledge of essential grammar	Lecture	LN1108.3	Mid Term I End Term
16	Common errors	Analyse and acquire knowledge of essential grammar	Lecture	LN1108.3	Mid Term I End Term
17	**Effective Writing:** Précis writing	Improve ideas with precision and coherence in making formal written	Discussion	LN1108.4	Mid Term II End Term

		communication to enhance employability skills			
18	Letter types, Memos	Improve ideas with precision and coherence in making formal written communication to enhance employability skills	Discussion	LN1108.4	Mid Term II End Term
19	E-Mails, Circulars, Press Releases, Newsletters, Notices	Improve ideas with precision and coherence in making formal written communication to enhance employability skills	Discussion	LN1108.4	Mid Term II End Term
20	Statement of Purpose	Improve ideas with precision and coherence in making formal written communication to enhance employability skills	Lecture & activity	LN1108.4	Mid Term II End Term
21	Resume writing	Improve ideas with precision and coherence in making formal written communication to enhance employability skills	Lecture & activity	LN1108.4	Mid Term II End Term
22	**Art of Public Speaking**: Tips for effective presentations	Recognize the importance of speaking skills through debates and discussions	Lecture & activity	LN1108.5	Mid Term II End Term
23	**Group discussion**	Recognize the importance of speaking skills through debates and discussions	Lecture & activity	LN1108.5	Mid Term II End Term
24-26	**Revision and Discussion**	NA	Revision, Activity & Presentation	NA	NA

H. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES									
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
[LN1108.1]	Interpret the basic principles and importance of effective communication	1	2		1	1		1		2	
[LN1108.2]	Develop vocabulary for communicative competence		2	1						1	
[LN1108.3]	Analyse and acquire knowledge of essential grammar		1	1						1	1
[LN1108.4]	Improve ideas with precision and coherence in making formal written communication to enhance employability skills	1	2	1				3		2	1
[LN1108.5]	Recognize the importance of speaking skills through debates and discussions		3	2	1			2		3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Mathematics-II | MA 1202 | 4 Credits | 3 1 0 4

Session: Mar 21 – Jun 21 | Faculty: Dr. Garima Agarwal | Class: BCA II SEMESTER

A. **Introduction:** This course aims to discuss basic concept of Differential calculus. Course is intended to provide the students the experience in applications of differential calculus and to emphasize the practical aspects of differential calculus.

B. **Course Outcomes:** At the end of the course, students will be able to :

[1202.1]. Demonstrate the concepts of Differential calculus and its applications.

[1202.2]. Illustrate Partial derivatives with applications.

[1202.3]. understand the basic concept of linear algebra.
[1202.4]. Demonstrate the concepts of Infinite series.

C   Program Outcomes:

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

 PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

C.   **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.	

D.   **SYLLABUS**

Differential Calculus: Successive differentiation, Leibnitz's theorem, polar curve, angle between radius vector and tangent, angle of intersection between two curves, derivative of arc (Cartesian and polar), curvature, radius of curvature, evolute, related problems. Rolle's Theorem, mean value theorem (Cauchy's and Lagrange's), in determinant form, **partial derivatives,** Euler's theorem, maxima and minima of functions of two variables. **Linear Algebra**: Basic concepts, matrix addition, scalar multiplication, matrix multiplication, linear system of equations, Gauss elimination, rank of a matrix, Solution of Linear Systems: Existence, uniqueness, determinants, Cramer's rule, inverse of a matrix, Gauss-Jordan elimination. **Infinite Series:** Convergence, divergence, comparison test, ratio test, Cauchy's root test, Cauchy's integral test, alternating series, Leibnitz's theorem, absolute and conditional convergence, expansion of functions into Taylor's and Maclaurin's series.

E.   **TEXT BOOKS**

1. S. Narayan, P.K. Mittal, *Differential calculus*, S. Chand & Co, Delhi, 2012.
2. S. Narayan, P.K. Mittal, *Integral calculus*, S. Chand & Co, Delhi, 2012.

F.   **REFERENCE BOOKS**

1. M.D. Raisinghania, *Differential calculus*, S. Chand & Co, Delhi, 2010.
2. B. N. Mukherjee, *Integral Calculus*, U.N. Dhur, 1977.
3. N. Piskunov*, Differential and integral calculus*, Vol I & Vol II, CBS, 2000.

G.   **Lecture Plan:**

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
1.		Introduction to PO,CO,PSO	Understand PO,CO,PSO	Lecture	NA	Mid Term I, Quiz & End Term
2.	Differential Calculus	Introduction of Differential calculus	basic concept of Calculus	Lecture	1202.1	Mid Term I, Quiz & End Term
3.		Successive Differentiation	understanding Calculus	Lecture	1202.1	Mid Term I, Quiz & End Term
4.		Leibnitz Theorem	understanding Calculus	Lecture	1202.1	Mid Term I, Quiz & End Term
5.		Illustrative examples	Class problems	Tutorial	1202.1	
6.		Angle between radius vector and tangents	applications of Differential calculus	Lecture	1202.1	Mid Term I, Quiz & End Term
7.		Angle of intersection between two	applications of Differential	Lecture	1202.1	Mid Term I, Quiz & End Term

8.		Derivatives of arc (Cartesian and	applications of Differential	Lecture	1202.1	Mid Term I, Quiz & End Term
9.		Curvature, Radius of curvature	applications of Differential	Lecture	1202.1	Mid Term I, Quiz & End Term
10.		Evolutes and related problems	applications of Differential	Lecture	1202.1	
11.		Rolle's Theorem and related problems	applications of Differential	Lecture	1202.1	Mid Term I, Quiz & End Term
12.		Mean value theorem (cauchy's	applications of Differential	Lecture	1202.1	Mid Term I, Quiz & End Term
13.		Illustrative examples	Class problems	Tutorial	1202.1	
14.		Quiz-1	evaluation	Activity	1202.1	
15.	Partial Derivatives	Introduction	understanding partial	Lecture	1202.2	Mid Term I, Quiz & End Term
16.		Euler's Theorem	concept of Partial	Lecture	1202.2	Mid Term I, Quiz & End Term
17.		Illustrative examples	Class problems	Tutorial	1202.2	
18.		Maxima and minima of two variable function	applications of Partial Derivatives	Lecture	1202.2	Mid Term I, Quiz & End Term
19.		Illustrative examples	Class problems	Tutorial	1202.2	
20.		Quiz-2	evaluation	Activity	1202.2	
21.	Linear Algebra	Introduction	understanding Linear Algebra	Lecture	1202.3	Mid Term I, Quiz & End Term
22.		Matrix addition and multiplication	application of Linear Algebra	Lecture	1202.3	Mid Term I, Quiz & End Term
23.		Illustrative examples	Class problems	Tutorial	1202.3	
24.		Solution of Linear system of equation	application of Linear Algebra	Lecture	1202.3	Mid Term I, Quiz & End Term
25.		Gauss elimination Method	application of Linear Algebra	Lecture	1202.3	
26.		Illustrative examples	Class problems	Tutorial	1202.3	
27.		Gauss-Jorden elimination	application of Linear Algebra	Lecture	1202.3	Mid Term I, Quiz & End Term
28.		Illustrative examples	Class problems	Tutorial	1202.3	
29.		Rank of matrix	application of Linear Algebra	Lecture	1202.3	Mid Term I, Quiz & End Term
30.		Illustrative examples	Class problems	Tutorial	1202.3	
31.		Inverse of matrix	application of Linear Algebra	Lecture	1202.3	Mid Term I, Quiz & End Term
32.		Solution of linear system of equations	application of Linear Algebra	Lecture	1202.3	Mid Term II, Quiz & End Term
33.		Illustrative examples	Class problems	Tutorial	1202.3	
34.		Cramers Rule	application of Linear Algebra	Lecture	1202.3	Mid Term II, Quiz & End Term
35.		Illustrative examples	Class problems	Tutorial	1202.3	

36.		Quiz-3	evaluation	Activity	1202.3	
37.	Infinite Series	Introduction	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
38.		Comparison test	concept of Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
39.		Illustrative examples	Class problems	Tutorial	1202.4	
40.		Ration test	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
41.		Illustrative examples	Class problems	Tutorial	1202.4	
42.		Cauchy's root test	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
43.		Illustrative examples	Class problems	Tutorial	1202.4	
44.		Cauchy's integral test	understanding Infinite Series	Lecture	1202.4	
45.		Leibnitz Theorem	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
46.		Absolute convergence	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
47.		Conditional convergence	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
48.		Expansion of function into Taylors series	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
49.		Expansion of function into Maclaurin	understanding Infinite Series	Lecture	1202.4	Mid Term II, Quiz & End Term
50.		Illustrative examples	Class problems	Tutorial	1202.4	
51.		Quiz-4	evaluation	Activity	1202.4	

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
MA 1202.1	Demonstrate the concepts of Differential calculus and its applications		2		1			1						2			

MA 1202.2	Illustrate Partial derivatives with applications.	1								1						1
MA 1202.3	Understand the basic concept of linear algebra.	1		1								2				
MA 1202.4	Demonstrate the concepts of Infinite series.			1				1							1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA 1202.1	Demonstrate the concepts of Differential calculus and its applications															
MA 1202.2	Illustrate Partial derivatives with applications.															
MA 1202.3	Understand the basic concept of linear algebra.															
MA 1202.4	Demonstrate the concepts of Infinite series.															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

FINANCIAL AND ACCOUNTING MANAGEMENT | CM1229| 4 Credits | 3 1 0 4

Session: Jan 20 – Jun 20 | Faculty: Rahul Sharma | Class: BCA II SEMESTER

A. **Introduction:** This course aims to discuss basic concept of Accounting Methods. Course is intended to provide the students the experience in learning various accounting methods.

B. **Course Outcomes:** At the end of the course, students will be able to :

C   Program Outcomes:

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

C. **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	20
End Term Exam	End Term Exam (Closed Book)	40

(Summative)			
	Total	100	
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.		

D. SYLLABUS

General Purpose Cost Statement: Evolution of Cost Accounting, Cost Accounting Concepts, Generally Accepted Cost Accounting Principles and Cost Accounting Standards, Cost Accounting Standards, Business Process Analysis: Materials, Employee Costs, Direct Expenses, Overheads, Treatment of Special Items, Cost Sheet, Overview of Financial Management: Objective of Financial Management, Key Decisions of Financial Management, Planning Environment, Functions of Financial Management, Sources of Finance, International Sources, Emerging Role of Finance Manager, Securities and Exchange Board of India Act. 1992, Future Value, Present Value, Tools for Financial Analysis and Planning: Funds Flow Statement Cash Flow Statement, Ratio Analysis, Identification of Information Required to Assess Financial Performance, Working Capital Management and Leverage Analysis: Working Capital - Meaning and Definition, Kinds of Working Capital, Adequacies and Inadequacies of Working Capital, Danger of too high amount of Working Capital, Danger of inadequacies or low amount of Working Capital, Working Capital Cycle, Working Capital Financing, Inventory Management, Management of Receivable, Determinants of Credit Policy, Cash Management, Leverages, EBIT-EPS Indifference Point Level, Calculation of Indifference Point, Cost of Capital: Cost of Capital, Capital Structure, Dividend Decisions.

E. TEXT BOOKS

1. J. Pratt, Financial Accounting in an Economic Context, (5e), John Wiley & Sons, 2010.

F. Lecture Plan:

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
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I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application
Course Hand-out

DATA STRUCTURES| CA 1201| 3 Credits | 3 1 0 4

Session: Jan 21 – June 21 | Faculty: Linesh Raja | Class: BCA (II Sem)

A. Introduction: Data Structure is a way of collecting and organising data in such a way that we can perform operations on these data in an effective way. Data Structures is about rendering data elements in terms of some relationship, for better organization and storage. Data Structures are structures programmed to store ordered data, so that various operations can be performed on it easily. It represents the knowledge of data to be organized in memory. It should be designed and implemented in such a way that it reduces the complexity and increases the efficiency.

A good algorithm usually comes together with a set of good data structures that allow the algorithm to manipulate the data efficiently. In this course, we consider the common data structures that are used in various computational problems. You will learn how these data structures are implemented in different programming languages and will practice implementing them in our programming assignments. This will help you to understand what is going on inside a particular built-in implementation of a data structure and what to expect from it. You will also learn typical use cases for these data structures.

B. Course Outcomes: At the end of the course, students will be able to

[1201.1]. Understand computer algorithm and their applications.

[1201.2]. Learn and apply the concepts of Linear and non linear data structure and their complexity.

[1201.3]. Describe and Implement various linear data structure concepts in terms of array, stack and queue.

[1201.4]. Learn and Implement various non linear data structure concept in terms of linked list, tree and graph.

[1201.5]. Understand, Learn and finally Implement the use of advanced programming constructs/features in real-life programming domains for improving employability.

[1201.6]. Visualize a real world problem in the form of programming statement.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

[PSO.1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.

[PSO.2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[PSO.3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Introduction: Definitions, Concept of Data Structures, Overview of Data Structures. Arrays: Definitions, terminologies, 1D Array: Memory allocation, Operations on array, Application of Arrays, 2D and 3D Array representation

Linked Lists: Definition, Single Linked List: Representation in memory, operations (insertion, deletion, modify etc.), Circular Linked List, Double Linked List.

Stacks: Definition, Array and linked-list representation of stack, Operations on Stack: Push, Pop, application of stack: infix to postfix, evaluation of arithmetic expression, tower of Hanoi. **Queues**: Definition, Array and linked-list representation of Queue. Operations on Queue: Insertion, Deletion. Various Queue Structure: Circular Queue, Priority Queue. Insertion, Deletion operations on a Circular Queue and Priority Queue

Sorting and Searching: Insertion Sort, Selection Sort, Merge Sort, Linear Search, Binary Search.

Tree: Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, insertion and deletion, Binary search trees, Applications of Trees- Some balanced tree mechanism, e.g. AVL trees, 2-3 trees, Height Balanced, Weight Balance, B Tree, B+ Tree, **Graph**-Matrix Representation of Graphs, Elementary Graph operations.

F. Text Books

T1. Data Structures and Algorithms using C, By R. S. Salaria

G. Reference Books

R1. A. M. Tenenbaum, Data Structures Using C, (1e), Pearson Education, 2008.

R2. R. Thareja, Data Structures Using C, (2e), Oxford University Press, 2014.

H. Lecture Plan:

Lec No	Major Topics	Topics	Session outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to Data Structure	Introduction and Course Hand-out briefing	Overview	Lecture	NA	NA
2		Definitions, Concept of Data Structures	Basics of Data Structure	Lecture	1201.1	In Class Quiz (Not Accounted)
3		Overview of Data Structures	Basics of Data Structure	Lecture	1201.1	In Class Quiz End Term
4		Arrays: Definitions, terminologies	Basics of Data Structure	Guided Self-Study	1201.1	Home Assignment End Term
5		1D Array: Memory allocation, Operations on array	Basics of Data Structure in terms of array & their applications	Lecture	1201.2	In Class Quiz End Term
6		Application of Arrays, 2D and 3D Array representation	Basics of Data Structure in terms of array & their applications	Activity	1201.2	Class Quiz Mid Term I End Term
7	Linked List	Definition, Single Linked List: Representation in memory	Overview of Linked list	Lecture	1201.2	Class Quiz Mid Term I End term
8-9		operations (insertion, Deletion, modify etc.)	Linked list implementation	Lecture	1201.2	Home Assignment Class Quiz Mid Term I End Term
10		Circular Linked List	Linked list implementation	Activity	1201.2	Class Quiz Mid Term I End Term
11-12		Double Linked List	Linked list implementation	Lecture	1201.2	Class Quiz Mid Term I End Term
13	Stack	Definition, Array and linked-list representation of stack	Applications of Linked List	Lecture	1201.2	Class Quiz End Term
14		Operations on Stack: Push	Basics of Stack and their operations	Lecture	1201.4	Class Quiz Mid Term II End Term
15		Operations on Stack: Pop	Basics of Stack and their operations	Lecture	1201.4	Class Quiz Mid Term II End Term
16		application of stack: infix to postfix	Stack applications	Lecture	1201.4	Class Quiz Mid Term II End Term
17		evaluation of	Stack applications	Lecture	1201.4	Class Quiz

		arithmetic expression				Mid Term II End Term
18		tower of Hanoi	Stack applications	Lecture	1201.4	Class Quiz End Term
19	Queues	Definition, Array and linked-list representation of Queue	Applications of Linked List	Lecture	1201.4	Class Quiz End Term
20		Operations on Queue: Insertion, Deletion	Operations of Queue	Lecture	1201.4	Class Quiz End Term
21		Various Queue Structure: Circular Queue, Priority Queue	Applications of Queue	Lecture	1201.4	Class Quiz End Term
22-24		Insertion, Deletion operations on a Circular Queue and Priority Queue	Operations of Circular Queue	Lecture	1201.5	Class Quiz End Term
25-26	Sorting and Searching	Insertion Sort, Selection Sort	Operations on sorting	Lecture	1201.5	Class Quiz End term
27-28		Merge Sort	Operations on sorting	Lecture	1201.5	Class Quiz
29-30		Linear Search, Binary Search	Operations on searching	Lecture	1201.5	Class Quiz Mid Term II End Term
31	Tree	Definitions and Concepts, Representation of binary tree	Basics of Tree and their operations	Lecture	1201.3 1201.5	Class Quiz Mid Term II End Term
32		Binary tree traversal (Inorder, postorder, preorder)	Tree functions	Lecture	1201.3 1201.5	Class Quiz Mid Term II End Term
33		Threaded binary tree, insertion and deletion	Tree operations	Lecture	1201.3 1201.5	Class Quiz End Term
34		Binary search trees, Applications of Trees	Tree operations	Lecture	1201.4 1201.6	Class Quiz End Term
35-36		AVL trees, 2-3 trees, Height Balanced, Weight Balance, B Tree, B+ Tree	Tree applications	Lecture	1201.6	Class Quiz End Term
37-38	Graph	Matrix Representation of Graphs	Basics of Graph and their operations	Lecture	1201.6	Class Quiz End Term
39-40		Elementary Graph operations	Graph implementation	Lecture	1201.6	Class Quiz End Term
41-42		Revision	Outcome of course	Lecture	NA	NA
LAB SESSIONS	DS	Data Structure &Their Application Development using C Programming	Data structure concept implemetations	Lab Sessions	1201.1 - 1201.6	Experimental results 14 lab sessions End Term Practical End Term Theory

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1201.1	Understand computer algorithm and their applications.	3						1			2
CA 1201.2	Learn and apply the concepts of Linear and non linear data structure and their complexity.		2	2							2
CA 1201.3	Describe and Implement various linear data structure concepts in terms of array, stack and queue.				2	2			3		
CA 1201.4	Learn and Implement various non linear data structure concept in terms of linked list, tree and graph.						2		3		
CA 1201.5	Understand, Learn and finally Implement the use of advanced programming constructs/features in real-life programming domains for improving employability.			1					3	2	
CA 1201.6	Visualize a real world problem in the form of programming statement.	3	2	2	2				3	2	

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

J. Course Outcome Attainment Level Matrix

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%							ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1201.1	Understand computer algorithm and their applications.										
CA 1201.2	Learn and apply the concepts of Linear and non linear data structure and their complexity.										
CA 1201.3	Describe and Implement various linear data structure concepts in terms of array, stack and queue.										
CA 1201.4	Learn and Implement various non linear data structure concept in terms of linked list, tree and graph.										
CA 1201.5	Understand, Learn and finally Implement the use of advanced programming constructs/features in real-life programming domains for improving employability.										
CA 1201.6	Visualize a real world problem in the form of programming statement.										

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Application
Course Hand-out

Database Management System| CA 1202 | 4 Credits | 3 1 0 4

Session: Jan – May 2020 | Faculty: Pradeep Kumar | Class: BCA II

A.   **Introduction:** This course provides basic information about Database Management System. It provides the basic Conceptual background necessary to design and develop simple database system. The main Emphasize is to know the main features and functions of the DBMS and the features of Relational Database and ER models

B.   **Course Outcomes:** At the end of the course, students will be able to:

   [1202.1]. Describe main features and functions of the DBMS.

   [1202.2]. Design data independence and data models for database systems.

   [1202.3]. Classify features of Relational Database and ER Models.

   [1202.4]. Recite relational algebra concepts and use it to translate queries to relational algebra.

   [1202.5]. Outline and explain SQL queries.

   [1202.6]. Explain the concept of transaction, concurrency and recovery.

C.   **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

 PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D. **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	20
	Sessional Exam II	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. **SYLLABUS**

Introduction: Introduction to Database management system, some examples, characteristics of the database approach, Relational Model. **ER Models:** Database modeling using the entity-relationship model, entity types, entity sets attributes and keys, relationships. **Database Design:** Functional dependencies and normalization for relational databases. **SQL the Relational Database Standard:** Data definition, constraints, Basic Queries in SQL, More complex SQL queries, Insert, Update and Delete Statements in SQL. **Transaction Processing:** Transaction processing concepts: Introduction to transaction processing, transaction and system concepts, desirable properties of transactions, schedules and recoverability.

F. **TEXT BOOKS**

1. Ehmasri & Navathe, *"Fundamentals of Database Systems"*, (3rd Edition), Addison-Wesley,

   1999

2. Korth & S.Sudarshan, *"Database System Concepts"*, (5th edition), TATA McGraw Hill, 2002

G. **REFERENCE BOOKS**

1. C.J. Date, *"Introduction to Database Systems"*, Addison-Wesley, 1995.

Lecture Plan:

Lecture No.	Main Topics	Topic	Session outcome	Mode of delivery	Corresponding CO	Mode Of Assessing CO
1	Introduction to DBMS	Introduction to Database	Understanding of CO PO,PSO	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
2		Database Vs File System	Introduction to Database	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
3		Introduction to Database Management System & Database Management System-Examples	Knowledge of Database with examples	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
4		TUTORIAL	Knowledge of Database with examples	Activity	CA1202.1	Mid Term-I,Quiz & End Term
5		Characteristics of the database approach	Applications of database	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
6		Components of database system	Synthesis of DBMS structure	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
7		actors on the scene, Workers behind the scene Database user and database application	Synthesis of DBMS structure	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
8		TUTORIAL	Synthesis of DBMS structure	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
9		Functions of DBMS	Knowledge of DBMS	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
10		Advantages & Disadvantages of DBMS	Knowledge of DBMS	Flipped class	CA1202.1	Mid Term-I,Quiz & End Term
11		Database Architecture-Two Tire client/Server Architecture	Synthesis of DBMS structure	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
12		Database Architecture-Three Tire client/Server Architecture	Synthesis of DBMS structure	Lecture	CA1202.1	Mid Term-I,Quiz & End Term
13		TUTORIAL	Synthesis of DBMS structure	Lecture	CA1202.1	Mid Term-I,Quiz & End Term

14	Database Modeling	Database Models-OverviewRelational Model with Examples	Knowledge of DBMS models	Lecture	CA1202.2 & CA1202.3	Mid Term-I,Quiz & End Term
15		Relational Model and Relational algebra	Analyse dbms models	Lecture	CA1202.2 & CA1202.3 & CA1202.4	Mid Term-II,Quiz & End Term
16		ER Models with examples Database modeling using the entity-relationship model	Analyse dbms models	Activity	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
17		TUTORIAL	Analyse dbms models	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
18		Entity types, Entity sets	Knowledge of database models	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
19		attributes, relationships	Knowledge of database models	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
20		Concept of keys	Knowledge of keys	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
21		TUTORIAL	Knowledge of keys	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
22		Database Design-I & Database Design-II	Introduction to Database Design	Activity	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
23	Relation Model	Functional Dependencies	Introduction to functional dependecies	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
24		Normalization for relational databases-Overview	Introduction to normalization	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
25		Problem without Normalization	Introduction to normalization	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
26		TUTORIAL	Introduction to normalization	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
27		Normal forms-I & Normal forms-II	Introduction to normalization	Lecture	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term
28		Example of Normal Form	Introduction to normalization	Activity	CA1202.2 & CA1202.3	Mid Term-II,Quiz & End Term

	SQL	Database languages and interfaces	Comprehension on SQL	Lecture	CA1202.5	Mid Term-II,Quiz & End Term
29						
30		TUTORIAL	Comprehension on SQL	Lecture	CA1202.5	Mid Term-II,Quiz &
31		Introduction to SQL & Introduction to SQL Commands-DDL,DML,DCL,TCL	Introduction to SQL	Flipped Class	CA1202.5	Mid Term-I & II,Quiz & End Term
32		DDL: Data Definition Language(Basic Queries)-I	Introduction to SQL	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
33		DDL: Data Definition Language(Basic Queries)-II	Introduction to SQL	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
34		TUTORIAL	Introduction to SQL	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
35		DML: Data Manipulation Language(Basic Queries)-I & DML: Data Manipulation Language(Basic Queries)-II	Introduction to SQL-dml	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
36		DCL: Data Control Language(Basic Queries)	Introduction to SQL-dcl	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
37	Transaction Concept	TCL: Transaction Control Language(Basic Queries)	Introduction to SQL-tcl	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
38		TUTORIAL	Introduction to SQL-tcl	Lecture	CA1202.5	Mid Term-I & II,Quiz & End Term
39		More complex SQL queries	Synthesis-sql queries	Activity	CA1202.5	Mid Term-I & II,Quiz & End Term
40		Specifying general constraints as assertion and Additional features of SQL-I	Synthesis-constraints	Lecture	CA1202.5	Quiz & End Term
41		Specifying general constraints as assertion and Additional features of SQL-II	Synthesis-integrity constraints	Lecture	CA1202.5	Quiz & End Term
42		TUTORIAL	Synthesis-integrity constraints	Lecture	CA1202.5	Quiz & End Term
43		Introduction to transaction & Introduction to transaction processing-concepts	Introduction to transaction	Lecture	CA1202.6	Quiz & End Term
44		Transaction and system concepts	Knowledge and	Flipped class	CA1202.6	Quiz & End Term

			Introduction to transaction			
45			Desirable properties of transactions	Application to SQL Transaction	Lecture	CA1202.6	Quiz & End Term
46			TUTORIAL	Application to SQL Transaction	Lecture	CA1202.6	Quiz & End Term
47			Techniques for concurrency-I	Introduction Techniques for concurrency	Lecture	CA1202.6	Quiz & End Term
48			Introduction to concurrency & Techniques for concurrency-II	Introduction Techniques for concurrency	Lecture	CA1202.6	Quiz & End Term
49			TUTORIAL	Introduction Techniques for concurrency	Lecture	CA1202.6	Quiz & End Term
50			Database Recovery Techniques-I	Introduction to recovery	Lecture	CA1202.6	Quiz & End Term
51			Database Recovery Techniques-II	Introduction to recovery techniques	Lecture	CA1202.6	Quiz & End Term
52			TUTORIAL	Introduction to recovery technques	Lecture	CA1202.6	Quiz & End Term

H.   Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 1202.1	Describe main features and functions of the DBMS.				2									1		
CA 1202.2	Design data independence and data models for database systems.			1		2									2	
CA 1202.3	Classify features of Relational Database and ER Models.				2			2						3		
CA 1202.4	Recite relational algebra concepts and use it to translate queries to relational algebra.	2														
CA 1202.5	Outline and explain SQL queries.					2								2		
CA 1202.6	Explain the concept of transaction, concurrency and recovery.				2	1										2

1-   Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Bachelor of Computer Application
Course Hand-out

Principles of Programming Languages | CA 1204 | 4 Credits | 3 1 0 4

Session: Jan 20 – June 20 | Faculty: Dr. Vaibhav Bhatnagar | Class: BCA II SEMESTER

- **Introduction:** This course will introduce students to the fundamental concepts programming languages. Main objective of the course is to familiarize students about core concepts and principles in programming languages like program compilation, programming environments, data types, scope, binding and object oriented concepts. It will cover high order evaluation, logic languages, functional programming, stack layout, parameter passing, file input and output. The emphasis is on studying and analysing fundamental issues in programming design.

A. **Course Outcomes:** At the end of the course, students will be able to

[1204.1] Analyze the concepts of programming languages and programming paradigms.

[1204.2] List out various Data bindings and Scope rules in programming languages.

[1204.3] Recall the Concepts of Structured and unstructured flow, Function, Recursion, Pointers, Lists, Expression evaluation, Files and Input/Output.

[1204.4] Understanding the basic Concepts of Object-Oriented Programming Language.

[1204.5] Implement logic programming concepts by using PROLOG.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

[PSO1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

[PSO2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems

[PSO3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

B. **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

C. SYLLABUS

Introduction: Programming language - design, spectrum and the study motivation, Compilation and interpretation; Programming environments; Names, Scope, and Bindings: Concept of binding time, Object lifetime and storage management, Scope rules and implementing scope, The binding of reference environments, Binding within a scope, Separate compilation; Control Flow: Expression evaluation, Structured and unstructured flow, Sequencing, Selection, Iteration, Recursion, Non-determinacy; Data Types: Type systems and checking, Records and variants, Arrays, Strings, Sets, Pointers and recursive types, Lists, Files and Input/Output, Equality testing and assignment; Subroutines and Control Abstraction: Stack layout, Calling sequences, Parameter passing, Generic subroutines and modules, Exception handling, Co-routines; Data Abstraction, Object Orientation: Object oriented programming, Encapsulation and Inheritance, Dynamic method binding; Functional Languages: Origins, Concepts, Scheme, Evaluation order, Higher-order functions, Functional programming in perspective; Logic Languages: Concepts, Prolog, Logic programming in perspective; Scripting Languages: Common characteristics.

D. TEXT BOOKS
1. M.L. Scott, "Programming Language Pragmatics", 2nd Edition, Elsevier, 2006.

E. REFERENCE BOOKS

1. R. Sethi, "Programming languages Concepts and Constructs", 2nd Edition, Pearson Education, 1996.

2. R Sebesta, "Concepts of Programming Languages", 8th Edition, Pearson Education, 2008.

3. A. Tucker, R.Nonan, "Programming languages", Tata McGraw-Hill, 2002.M.M. Mano, "Computer System Architecture", PHI, 2009.

Lecture Plan:

LEC NO	Major Topics	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Accessing CO
1		Programming language – design	Understanding CO and PO	Lecture	1204.1	Mid Term I, Quiz & End Term
2		Programming Spectrum	Concept of PPL	Lecture	1204.1	Mid Term I, Quiz & End Term
3		Motivation study	Concept of PPL	Lecture	1204.1	Mid Term I, Quiz & End Term
4	**Introduction**	Compilation and interpretation	Concept of PPL	Lecture	1204.1	Mid Term I, Quiz & End Term
5		Programming environments	Concept of PPL	Lecture	1204.1	Mid Term I, Quiz & End Term
6		Concept of binding time	Data Binding	Lecture	1204.2	Mid Term I, Quiz & End Term
7		Object lifetime	Data Binding	Lecture	1204.2	Mid Term I, Quiz & End Term
8		storage management	Data Binding	Lecture	1204.2	Mid Term I, Quiz & End Term
9	**Names, Scope, and Bindings**	Scope rules and implementing scope	Scope of Variable	Lecture	1204.2	Mid Term I, Quiz & End Term
10		The binding of reference environments	Scope of Variable	Flipped Class	1204.2	Mid Term I, Quiz & End Term
11		Binding within a scope	Binding	Lecture	1204.2	Mid Term I, Quiz & End Term
12		Separate compilation	Binding	Lecture	1204.2	Mid Term I, Quiz & End Term
13		Expression evaluation	Expression Evaluation	Lecture	1204.3	Mid Term I, Quiz & End Term
14	**Control Flow**	Structured and unstructured flow	Structured Flow	Lecture	1204.3	Mid Term I, Quiz & End Term
15		Sequencing	Structured Flow	Lecture	1204.3	Mid Term I, Quiz & End Term

16		Selection	Structured Flow	Lecture	1204.3	Mid Term I, Quiz & End Term
17		Iteration	Structured Flow	Lecture	1204.3	Mid Term I, Quiz & End Term
18		Recursion	Structured Flow	Lecture	1204.3	Mid Term I, Quiz & End Term
19		Non-determinacy	Structured Flow	Flipped Class	1204.3	Mid Term I, Quiz & End Term
20		Type systems	Structured Flow	Lecture	1204.3	Mid Term I, Quiz & End Term
21		Type Checking	Structured Flow	Activity	1204.2, 1204.3	Mid Term I, Quiz & End Term
22		Records and variants	Structured Flow	Lecture	1204.2	Mid Term II, Quiz & End Term
23		Arrays	Data Storage	Lecture	1204.3	Mid Term II, Quiz & End Term
24		Strings	Data Storage	Lecture	1204.3	Mid Term II, Quiz & End Term
25	**Data Types**	Sets	Data Storage	Lecture	1204.2, 1204.3	Mid Term II, Quiz & End Term
26		Pointers	Data Storage	Lecture	1204.3	Mid Term II, Quiz & End Term
27		recursive types	Data Storage	Lecture	1204.1	Mid Term II, Quiz & End Term
28		Lists	Data Storage	Lecture	1204.2	Mid Term II, Quiz & End Term
29		Files and Input/Output	File Handling	Lecture	1204.3	Mid Term II, Quiz & End Term
30		Equality testing and assignment	Data Storage	Lecture	1204.3	Mid Term II, Quiz & End Term
31	**Subroutines and Control Abstraction**	Stack layout	Data Storage	Lecture	1204.3	Mid Term II, Quiz & End Term
32		Calling sequences, Parameter passing	Unstructured Flow	Lecture	1204.3	Mid Term II, Quiz & End Term

33		Generic subroutines and modules	Unstructured Flow	Lecture	1204.3	Mid Term II, Quiz & End Term
34		Exception handling	Unstructured Flow	Flipped Class	1204.3	Mid Term II, Quiz & End Term
35		Co-routines	Unstructured Flow	Lecture	1204.3	Mid Term II, Quiz & End Term
36	**Data Abstraction, Object Orientation**	Object oriented programming	Concepts of OOPs	Activity	1204.4	Mid Term II, Quiz & End Term
37		Encapsulation and Inheritance	Concepts of OOPs	Lecture	1204.4	Mid Term II, Quiz & End Term
38		Dynamic method binding	Concepts of OOPs	Lecture	1204.2, 1204.4	Mid Term II, Quiz & End Term
39	**Functional Languages**	Origins, Concepts	Concepts of OOPs	Lecture	1204.4	Mid Term II, Quiz & End Term
40		Functional programming Scheme	Concepts of OOPs	Lecture	1204.4	Quiz & End Term
41		Evaluation order	Concepts of OOPs	Lecture	1204.4	Quiz & End Term
42		Higher-order functions	Concepts of OOPs	Lecture	1204.4	Quiz & End Term
43		Functional programming in perspective	Concepts of OOPs	Lecture	1204.4	Quiz & End Term
44	**Logic Languages**	Concepts	Prolog Implementation	Lecture	1204.3	Quiz & End Term
45		Prolog	Prolog Implementation	Lecture	1204.5	Quiz & End Term
46		Logic programming in perspective	Prolog Implementation	Lecture	1204.5	Quiz & End Term
47	**Scripting Languages**	Common characteristics	Prolog Implementation	Lecture	1204.5	Quiz & End Term
48		Common characteristics	Prolog Implementation	Lecture	1204.5	Quiz & End Term
49		Revision-1	PPL	Activity	1204.1,	Quiz & End Term
50		Revision-2	Binding	Activity	1204.2	Quiz & End Term
51		Revision-3	OOPs Concepts	Activity	1204.4	Quiz & End Term

| 52 | | Revision-4 | Prolog Concept | Activity | 1204.5 | Quiz & End Term |

F.   Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 1204.1	Analyze the concepts of programming languages and programming paradigms.	3						2						1		
CA 1204.2	List out various Data bindings and Scope rules in programming languages.		2	2				1							3	
CA 1204.3	Recall the Concepts of Structured and unstructured flow, Function, Recursion, Pointers, Lists, Expression evaluation, Files and Input/Output.	1			2	3								3		
CA 1204.4	Understanding the basic Concepts of Object-Oriented Programming Language				2		3	2								2
CA 1204.5	Implement logic programming concepts by using PROLOG.							3							2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications
Course Hand-out

Basic Statistics and Probability | MA 2107 | 4 Credits | 3 1 0 4

Session: Jul 20 – Nov 2020 | Faculty: Dr. Garima Agarwal | Class: BCA III SEMESTER

A.   **Introduction:** This course is offered by Dept. of Computer Application, targeting students who wish to pursue research & development in industries or higher studies. The aim of the department of Computer Application is to produce highly, well qualified and motivated graduates possessing fundamental knowledge of Computer Application and research of software who can provide leadership and service to our nation and world. The main focus of the department of Computer Application is to be recognized as a trendsetter of its undergraduate programme through focus on core competencies, multidisciplinary collaborations, and quality in education. This course provides the Basic concept of statistic and central tendency and measure of dispersion. Student will find the permutation and combination as well. Basic concept of probability is also incorporated in this course.

B.   **Course Outcomes:** At the end of the course, students will be able to :

[2107.1]. To understand the concept of basic statistics.
[2107.2]. To understand the concept of Central tendency and Dispersion.
[2107.3]. To understand the concept of Dispersion.
[2107.4]. To understand the application of Permutation and combination.
[2107.5]. To understand the concept of Probability.

C   **Program Outcomes:**

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

C. **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.	

D. **SYLLABUS**

Population, Sample and Data Condensation Definition and scope of statistics, concept of population and simple with Illustration, Raw data, attributes and variables, classification, frequency distribution, Cumulative frequency distribution.

Measures of Central Tendency Concept of central Tendency, requirements of a good measure of central tendency, Arithmetic mean, Median, Mode, Harmonic Mean, Geometric mean for grouped and ungrouped data.

Measures of Dispersion: Concept of dispersion, Absolute and relative measure of dispersion, range variance, Standard deviation, Coefficient of variation

Permutations and Combinations Permutations of 'n' dissimilar objects taken 'r' at a time (with or without repetitions). $nPr = n!/(n-r)$!(without proof). Combinations of 'r' objects taken from 'n' objects. $nCr = n!/(r!(n-r)!)$ (Without proof). Simple examples, Applications.

Sample space, Events and Probability Experiments and random experiments, Ideas of deterministic and non-deterministic experiments; Definition of sample space, discrete sample space, events; Types of events, Union and intersections of two or more events, mutually exclusive events, Complementary event, Exhaustive event; Simple examples. Classical definition of probability, Addition & multiplication theorems of probability without Proof (upto three events are expected). Definition of conditional probability Definition of independence of two events, total probability theorem and Bay's theorem, simple numerical problems. Multiple Correlation and Regression (for the three variables only).

E. **TEXT BOOKS**
1. S. C. Gupta - Fundamentals of statistics - Sultan chand & sons, Delhi.
2. Goon, Gupta And Dasgupta - Fundamentals of statistics - The World Press Pvt. Ltd., Kolkata.

F. **REFERENCE BOOKS**

1. Rohtagi, V.K., *"An Introduction to Mathematical Statistics"*, John Wiley & Sons, 1976.
2. Mood A.M., Greybill, F.A. and Bose D.C, *"Introduction to the Theory of Statistics"*, McGraw Hill, 1974.
3. S.P. Gupta, *"Statistical Methods"*, Sultan Chand & Sons, New Delhi, 2008

G. **Lecture Plan:**

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
1.	**BASIC STATISTICS**	Concept of population	Understanding population	Lecture	2107.1	Mid Term I, Quiz & End Term
2.		Illustrative examples	Class problems	Tutorial	2107.1	Mid Term I, Quiz & End Term
3.		Concept of data and its type	Introduction of Data	Lecture	2107.1	Mid Term I, Quiz & End Term
4.		Illustrative examples	Class problems	Tutorial	2107.1	Mid Term I, Quiz & End Term
5.		Frequency distribution	Concept of Frequency	Lecture	2107.1	Mid Term I, Quiz & End Term
6.		Illustrative examples	Class problems	Tutorial	2107.1	Mid Term I, Quiz & End Term
7.		Quiz-1	evaluation	Activity	2107.1	Mid Term I, Quiz & End Term
8.	**MEASURE OF CENTRAL TENDENCY**	Concept of central tendency	Understanding of central	Lecture	2107.2	Mid Term I, Quiz & End Term
9.		Illustrative examples	Class problems	Tutorial	2107.2	Mid Term I, Quiz & End Term
10.		Arithmetic Mean	Concept of Arithmetic Mean	Lecture	2107.2	Mid Term I, Quiz & End Term
11.		Illustrative examples	Class problems	Tutorial	2107.2	Mid Term I, Quiz & End Term
12.		harmonic mean	Concept of harmonic	Lecture	2107.2	Mid Term I, Quiz & End Term
13.		Illustrative examples	Class problems	Tutorial	2107.2	Mid Term I, Quiz & End Term
14.		geometric mean	Concept of geometric mean	Lecture	2107.2	Mid Term I, Quiz & End Term
15.		Illustrative examples	Class problems	Tutorial	2107.2	Mid Term I, Quiz & End Term
16.		mean and mode	Concept of mean and mode	Lecture	2107.2	Mid Term I, Quiz & End Term
17.		Illustrative examples	Class problems	Tutorial	2107.2	Mid Term I, Quiz & End Term
18.		median	Understanding median	Lecture	2107.2	Mid Term I, Quiz & End Term
19.		Illustrative examples	Class problems	Tutorial	2107.2	Mid Term I, Quiz & End Term
20.		Quiz-2	evaluation	Activity	2107.2	Mid Term I, Quiz & End Term
21.		Templates	Templates implementatio	Tutorial	2107.2	Quiz & End Term
22.	**MEASURE OF DISPERSION**	Basic concept of dispersion	understanding dispersion	Lecture	2107.3	Mid Term I, Quiz & End Term
23.		Range variance	Basic concept of Range	Lecture	2107.3	Mid Term I, Quiz & End Term
24.		Standard Deviation	understanding Standard	Lecture	2107.3	Mid Term II, Quiz & End Term
25.		Coefficient of variation	understanding Coefficient of variation	Lecture	2107.3	Mid Term II, Quiz & End Term

26.		Quiz-3	evaluation	Activity	2107.3	Mid Term II, Quiz & End Term
27.	**PERMUTATION AND COMBINATION**	Definition and basic concept of Permutation	Understanding Permutation	Lecture	2107.4	Mid Term II, Quiz & End Term
28.		Illustrative examples	Class problems	Tutorial	2107.4	Mid Term II, Quiz & End Term
29.		Definition and basic concept of Combination	concept of Combination	Tutorial	2107.4	Mid Term II, Quiz & End Term
30.		Illustrative examples	Class problems	Tutorial	2107.4	Mid Term II, Quiz & End Term
31.		Quiz-4	evaluation	Activity	2107.4	Mid Term II, Quiz & End Term
32.	**PROBABILITY**	Concept of Sample space	Introduction of Sample space	Lecture	2107.5	Mid Term II, Quiz & End Term
33.		Concept of events and its types	understanding of events	Lecture	2107.5	Mid Term II, Quiz & End Term
34.		Properties of an event	understanding of events	Lecture	2107.5	Mid Term II, Quiz & End Term
35.		Illustrative examples	Class problems	Tutorial	2107.5	Mid Term II, Quiz & End Term
36.		Concept of probability	Understanding Probability	Lecture	2107.5	Mid Term II, Quiz & End Term
37.		Total Probability	Concept of Total Probability	Lecture	2107.5	Mid Term II, Quiz & End Term
38.		Illustrative examples	Class problems	Tutorial	2107.5	Mid Term II, Quiz & End Term
39.		Bayes Theorem	Concept of probability	Lecture	2107.5	Quiz & End Term
40.		Illustrative examples	Class problems	Tutorial	2107.5	Quiz & End Term
41.		Multiple correlation	understanding Correlation	Lecture	2107.5	Quiz & End Term
42.		Illustrative examples	Class problems	Tutorial	2107.5	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4

CO	STATEMENT	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MA 2107.1	To understand the concept of Basic Statistics.	1				2								2		
MA 2107.2	To understand the concept of Central tendency and Dispersion.		2				3									2
MA 2107.3	To understand the concept of Dispersion.		1	1										2		
MA 2107.4	To understand the application of Permutation and combination		2				1									
MA 2107.5	To understand the concept of Probability	1				3									1	

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

J. **Course Outcome Attainment Level Matrix:**

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
MA 2107.1	To understand the concept of Basic Statistics.															
MA 2107.2	To understand the concept of Central tendency and Dispersion.															
MA 2107.3	To understand the concept of Dispersion.															
MA 2107.4	To understand the application of Permutation and combination															
MA 2107.5	To understand the concept of Probability															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Application
Course Hand-out

Computer Organization and Architecture | CA 2101 | 4 Credits | 3 1 0 4

Session: Jul 20 – Dec 20 | Faculty: Pradeep Kumar | Class: BCA III

A. **Introduction:** This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user. It will cover machine level representation of data, instruction sets, computer arithmetic, CPU structure and functions, memory system organization and architecture, system input/output, multiprocessors, and digital logic. The emphasis is on studying and analysing fundamental issues in architecture design and their impact on performance.

B. **Course Outcomes:** At the end of the course, students will be able to

[2101.1] conceptualize the basics of organizational and architectural issues of a digital computer.

[2101.2] Design the concept of memory organization that uses banks for different word size operations.

[2101.3] create an assembly language program to program a microprocessor system.

[2101.4] Compare the generations of Computer with their advancements.

[2101.5] analyse the processor performance improvement using instruction level parallelism.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

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Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	20
	Sessional Exam II	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

General Computer Architecture: Block Diagram of typical Computer, Memory Section, Input/Output Section, CPU, Registers, Arithmetic Unit, Instruction handling Areas, Stacks. Micro operations: Register Transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shit Unit. Basic Computer Organization and Design: Instruction Codes,Operation code, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input Output Instructions and Interrupts. Control Memory: Control Word, Microinstruction, Microprogramming, Control Memory, Hardwired Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC, CISC Pipelining and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors Input Output Organization: I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, IOP, Serial Communication. Memory Organization: Associative Memory, Cache Memory, And Virtual Memory Introduction to Microprocessor: Machine Language, Assembly Language, Assembler, High Level Language, Compiler, Interpreter, Internal Architecture 8085.

F.   TEXT BOOKS

1.   Carl Hammacher, "Computer Organization" (5th Edition), TMH, 2011.

G.   REFERENCE BOOKS

1. M.M. Mano, "Computer System Architecture", PHI, 2009.

2. Govindarajalu, "Computer Architecture and Organization", (2nd Edition), TMH, 2008.

H.   Lecture Plan:

Lecture No.	Main Topics	Topic	Session outcome	Mode of delivery	Corresponding CO	Mode Of Assessing CO
1	General Computer Architecture	Introduction to computer Organization	Understanding of CO PO,PSO	Lecture	2101.1	Mid Term I, Quiz & End Term
2		Input/output Section,	Introduction to I/O architecture	Lecture	2101.1	Mid Term I, Quiz & End Term
3		CPU	Introduction to architecture	Lecture	2101.1	Mid Term I, Quiz & End Term
4		Registers	Introduction to architecture	Lecture	2101.1	Mid Term I, Quiz & End Term
5		Arithmetic Unit	Knowledge of arithmetic unit	Lecture	2101.1	Mid Term I, Quiz & End Term
6		Instruction handling Areas	Introduction to handling Areas	Lecture	2101.1	Mid Term I, Quiz & End Term
7		Stacks	Synthesis of Computer organisation	Lecture	2101.1, 2101.2	Mid Term I, Quiz & End Term
8		Micro operations: Register Transfer	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term
9		Bus and Memory Transfer	Knowledge of Data transfer	Lecture	2101.1, 2101.2	Mid Term I, Quiz & End Term
10		Arithmetic Micro operations	Synthesis of Computer organisation	Flipped Class	2101.1, 2101.3	Mid Term I, Quiz & End Term
11		Logic Micro operations	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term
12		Shift Micro operations	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term

13		Arithmetic Logic Shit Unit	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term
14		Instruction Codes	Introduction to Computer Design	Lecture	2101.3	Mid Term I, Quiz & End Term
15	Basic Computer Organization and Design:	Operation code	Synthesis of Computer Design	Lecture	2101.3	Mid Term I, Quiz & End Term
16		Timing and Control	Synthesis of computer design	Lecture	2101.3	Mid Term I, Quiz & End Term
17		Instruction Cycle	Knowledge of Computer organisation	Lecture	2101.3	Mid Term I, Quiz & End Term
18		Memory Reference Instructions	Knowledge of Computer organisation	Lecture	2101.2, 2101.3	Mid Term I, Quiz & End Term
19		Input Output Instructions	Knowledge of Computer organisation	Flipped Class	2101.3	Mid Term I, Quiz & End Term
20		Interrupts	Knowledge of Computer organisation	Lecture	2101.3	Mid Term I, Quiz & End Term
21		Tutorial	Synthesis of computer design	Activity	2101.2, 2101.3	Mid Term I, Quiz & End Term
22		Control Word	Introduction to control memory	Lecture	2101.2	Mid Term II, Quiz & End Term
23	Control Memory	Microinstruction	Introduction to control memory	Lecture	2101.3	Mid Term II, Quiz & End Term
24		Microprogramming	Synthesis of control memory	Lecture	2101.3	Mid Term II, Quiz & End Term
25		Control Memory	Synthesis of control memory	Lecture	2101.2, 2101.3	Mid Term II, Quiz & End Term
26		Hardwired	Knowledge of control memory	Lecture	2101.3	Mid Term II, Quiz & End Term
27		General Register Organization	Introduction to CPU	Lecture	2101.1	Mid Term II, Quiz & End Term
28	Central Processing Unit	Stack Organization	Knowledge of CPU	Lecture	2101.2	Mid Term II, Quiz & End Term
29		Instruction Formats	Analyze CPU	Lecture	2101.3	Mid Term II, Quiz & End Term

30		Addressing Modes	Analyze CPU	Lecture	2101.3	Mid Term II, Quiz & End Term
31		RISC and CISC	Analyze CPU	Lecture	2101.4	Mid Term II, Quiz & End Term
32	Pipelining and Vector Processing	Parallel Processing	Introduction to Pipelining	Lecture	2101.4,2101.5	Mid Term II, Quiz & End Term
34		Pipelining and Arithmetic Pipeline	Knowledge of pipeline	Lecture	2101.4, 2101.5	Mid Term II, Quiz & End Term
35		Instruction Pipeline	Synthesize piling	Flipped Class	2101.4, 2101.5	Mid Term II, Quiz & End Term
36		Vector Processing, Array Processors	Introduction to Vector Processing	Lecture	2101.4	Mid Term II, Quiz & End Term
37		Tutorial	Synthesize piling and VP	Activity	2101.4	Mid Term II, Quiz & End Term
38	Input Output Organization	I/O Interface	Introduction to Interface	Lecture	2101.4	Mid Term II, Quiz & End Term
39		Asynchronous Data Transfer	Application of I/O	Lecture	2101.2, 2101.4	Mid Term II, Quiz & End Term
40		Modes of Transfer	Application of I/O	Lecture	2101.4	Mid Term II, Quiz & End Term
41		Priority Interrupt	Application of I/O	Lecture	2101.4	Quiz & End Term
42		DMA	Application of I/O	Lecture	2101.4	Quiz & End Term
43		IOP	Synthesize I/O	Lecture	2101.4	Quiz & End Term
44		Serial Communication	Application of I/O	Lecture	2101.4	Quiz & End Term
45	Memory Organization	Associative Memory	Knowledge of Memory Organization	Lecture	2101.2	Quiz & End Term
46		Cache Memory	Knowledge of Memory Organization	Lecture	2101.2	Quiz & End Term
47		Virtual Memory	Knowledge of Memory Organization	Lecture	2101.2	Quiz & End Term
48	Introduction to Microprocessor	Machine Language and Assembly Language	Introduction to microprocessor	Lecture	2101.3	Quiz & End Term
49		Assembler, High Level Language	Introduction to microprocessor	Lecture	2101.1, 2101.3	Quiz & End Term

50		Compiler, Interpreter	Knowledge of Microprocessor	Flipped Class	2101.1, 2101.3	Quiz & End Term
51		Internal Architecture 8085.	Knowledge of Microprocessor	Lecture	2101.3	Quiz & End Term
52		Tutorial	Synthesize Microprocessor	Activity	2101.1, 2101.3	Quiz & End Term

C. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7						PSO 1	PSO 2	PSO 3
CA 2101.1	Conceptualize the basics of organizational and architectural issues of a digital computer		3					1							2	
CA 2101.2	Design the concept of memory organization that uses banks for different word size operations		2	2											2	
CA 2101.3	Create an assembly language program to program a microprocessor system.				2	3								3		
CA 2101.4	Compare the generations of Computer with their advancements.		3													1
CA 2101.5	Analyse the processor performance improvement using instruction level parallelism.				2										1	2

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MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Bachelor of Computer Application
Course Hand-out

Web Programming | CA 2102 | 4 Credits | 3 1 0 4

Session: July 20 – Dec 20 | Faculty: Dr. Vaibhav Bhatnagar | Class: BCA III SEMESTER

- **Introduction:** Web programming allows you to turn a simple, static HTML page into a dynamic masterpiece. It allows others to interact with your web site and use the application on any computer with Internet access. It is often easier than programming applications that will run directly on the computer. It allows you to make or edit anything dynamic on your website, such as a forum, a guestbook, or even a form submission.

A.   **Course Outcomes:** At the end of the course, students will be able to

> **[2102.1]** Understand and apply the concepts of HTML in comprehensive manner.
>
> **[2102.2]** Understand and apply the concepts of Cascading Style sheets in comprehensive manner.
>
> **[2102.3]** Understand and apply the concepts of JavaScript in comprehensive manner.
>
> **[2102.4]** Understand the concepts of Servlets.
>
> **[2102.5]** Understand the concepts of C# .Net.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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C. SYLLABUS

Introduction: HTML, features, uses & versions Using various HTML syntax, Head & Body Sections, , Inserting texts, Text alignment, Using images in pages, Hyperlinks – text and images, bookmarks, Backgrounds and Color controls, creating and using Tables in HTML, and presentation, Use of font size & Attributes, List types and its tags. Cascading Style sheets – defining and using simple CSS. Use of Frames and Forms in web pages, Image editors, Issues in Web site creations & Maintenance. Web Designing: Introduction to WYSIWYG Design tools, Introduction to Dreamweaver, Website Creation and maintenance, Web Hosting and Publishing Concepts; Client-Side Programming: The JavaScript Language, History and Versions; Introduction to JavaScript in Perspective: Syntax, Variables and Data Types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers; Representing Web Data: XML-Documents and Vocabularies Versions and Declaration Namespaces, Displaying XML Documents in Browsers; Server-Side Programming: Java Servlets Architecture , Overview- Servlet, Generating Dynamic Content, Life Cycle, Parameter Data, Sessions, Cookies; Electronic commerce: E - Business model, E – Marketing, Online payments and security. Database and Connectivity: ADO.Net. Distributed Application in C#, Visual programming interface with C#. Web controls, Web Forms.

D. TEXT BOOKS

1. Thomas Powell , "Web Design: The Complete Reference ", 1st Edition, Brandon A Nordin, 2000.

E. REFERENCE BOOKS

1. Kasture, Amol Bhagwat. "Web Technology With HTML 5.0." (2013).
2. Meyer, Eric A. *Cascading style sheets: The definitive guide.* " O'Reilly Media, Inc.", 2004.
3. Crockford, Douglas. *JavaScript: The Good Parts: The Good Parts.* " O'Reilly Media, Inc.", 2008.

Lecture Plan:

LEC NO	Major Topics	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Accessing CO
1		Introduction to HTML	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
2		Head and Body Section	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
3		Text Alignment and images	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
4		Hyperlinks and book Marks	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
5	HTML	Creating Table	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
6		List tag	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
7		Definition Tag	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
8		Advance HTML Tags	Understanding HTML	Lecture	2102.1	Mid Term I, Quiz & End Term
9		Cascading Style sheets – defining and using simple CSS	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
10		Types of CSS	Understanding CSS	Flipped Class	2102.2	Mid Term I, Quiz & End Term
11		Image editors	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
12	CSS	Text Decoration	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
13		Boarder	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
14		CSS Tables	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term

15		Links	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
16		Positions	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
17		CSS Forms	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
18		CSS Transformation	Understanding CSS	Lecture	2102.2	Mid Term I, Quiz & End Term
19		Introduction to JavaScript	Understanding JS	Flipped Class	2102.3	Mid Term I, Quiz & End Term
20		History and Version	Understanding JS	Lecture	2102.3	Mid Term I, Quiz & End Term
21		Syntax and Variable	Understanding JS	Activity	2102.3	Mid Term I, Quiz & End Term
22		Datatypes	Understanding JS	Lecture	2102.3	Mid Term II, Quiz & End Term
23	JavaScript	Statements, Operators	Understanding JS	Lecture	2102.3	Mid Term II, Quiz & End Term
24		Functions	Understanding JS	Lecture	2102.3	Mid Term II, Quiz & End Term
25		Objects	Understanding JS	Lecture	2102.3	Mid Term II, Quiz & End Term
26		Built in Functions	Understanding JS	Lecture	2102.3	Mid Term II, Quiz & End Term
27		JavaScript Validations	Understanding JS	Lecture	2102.3	Mid Term II, Quiz & End Term
28		Introduction to Servlets		Lecture	2102.4	Mid Term II, Quiz & End Term
29		Generating Dynamic Content,		Lecture	2102.4	Mid Term II, Quiz & End Term
30	Servlets	Life Cycle		Lecture	2102.4	Mid Term II, Quiz & End Term
31		Parameter Data, Sessions		Lecture	2102.4	Mid Term II, Quiz & End Term

32		Cookies		Lecture	2102.4	Mid Term II, Quiz & End Term
33		javax.servlet package		Lecture	2102.4	Mid Term II, Quiz & End Term
34		ServletConfig, ServletContext, ServletResponse		Flipped Class	2102.4	Mid Term II, Quiz & End Term
35		Supplying initialization parameters to Servlets		Lecture	2102.4	Mid Term II, Quiz & End Term
36		Performing database operations in Servlets		Activity	2102.4	Mid Term II, Quiz & End Term
37		Introduction to .Net		Lecture	2102.5	Mid Term II, Quiz & End Term
38		Framework of .Net		Lecture	2102.5	Mid Term II, Quiz & End Term
39		Libraries of .Net		Lecture	2102.5	Mid Term II, Quiz & End Term
40	**.Net and C#**	Introduction to C#		Lecture	2102.5	Quiz & End Term
41		C # Language Syntax		Lecture	2102.5	Quiz & End Term
42		Working with Arrays		Lecture	2102.5	Quiz & End Term
43		ASP controls		Lecture	2102.5	Quiz & End Term
44		ASP Cookies		Lecture	2102.5	Quiz & End Term
45		ASP Session		Lecture	2102.5	Quiz & End Term
46		ADO.net		Lecture	2102.5	Quiz & End Term
47	**Scripting Languages**	XML		Lecture	2102.5	Quiz & End Term
48		XML XML-Documents and VocabulariesVersions and Declaration		Lecture	2102.5	Quiz & End Term
49	**After Development**	Website Maintenance		Lecture	2102.1, 2,3,4,5	Quiz & End Term
50		Web hosting and Publishing Concept		Activity	2102.1, 2,3,4,5	Quiz & End Term
51		Dreamviewer and Other Tools		Activity	2102.1, 2,3,4,5	Quiz & End Term

| 52 | | Tutorial | | Activity | 2102.1, 2,3,4,5 | Quiz & End Term |

F.   Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 2102.1	Understand and apply the concepts of HTML in comprehensive manne	3						2		1				1		
CA 2102.2	Understand and apply the concepts of Cascading Style sheets in comprehensive manner.		2	2		1		1							3	
CA 2102.3	Understand and apply the concepts of JavaScript in comprehensive manner	1			2	3					1			3		
CA 2102.4	Understand the concepts of Servlets.				2		3	2								2
CA 2102.5	Understand the concepts of C# .Net..		2					3				1			2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application
Course Hand-out

OBJECT ORIENTED PROGRAMMING USING JAVA | CA 2103| 3 Credits | 3 1 0 4

Session: July 20 – Dec 20 | Faculty: Linesh Raja | Class: BCA (III Sem)

A. Introduction: Object oriented techniques have revolutionized the software development process and are used tremendously in IT industry to develop software products of various kinds. The course is designed to give students an in-depth understanding of the basic concepts of object-oriented programming such as encapsulation, inheritance and polymorphism using Java programming language. The course curriculum and structure has been divided into eight basic modules which covers the programming aspects related with object oriented domain such as exception handling, multithreading, GUI programming, event handling etc. The course will be taught with the help of several teaching aides such as power point presentation and via live debugging and execution demonstrations of several programming problems using Eclipse tool.

The main objective of the course is as follows:

- To teach students about the basics of classes and objects using Java programming language
- To enable the students to properly use the basic object oriented pillars such as encapsulation, inheritance and polymorphism.
- To enable the students to understand the basic difference between a class and an interface.
- To teach students about the implementation aspect of various basic data structures such as Linked Lists and
- Arrays using object oriented techniques
- To teach students how to provide various types of inheritance and polymorphism using classes and interfaces
- To introduce students about the role of modern programming constructs such as exceptions in modern
- programming languages
- To teach students about the basic of Multithreading, GUI Programming and Event handling

B. Course Outcomes: At the end of the course, students will be able to

[2103.1]. Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface.

[2103.2]. Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.

[2103.3]. Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

[2103.4]. Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

[2103.5]. Understand, Learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains for improving employability.

[2103.6]. Visualize a real world problem in the form of various collaborating classes and objects or skill development.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

[PSO.1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.

[PSO.2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[PSO.3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

THE HISTORY AND EVOLUTION OF JAVA: The Creation of Java, how java changed the internet, Java's Magic, Servlets, The java Buzzwords; An Overview of Java, arrays; **INTRODUCTION TO CLASSES**: Class fundamentals, declaring objects, Assigning Object reference variables, Introduction to methods, Constructors, this keyword, Garbage collection, finalize() method, Overloading, objects as parameters, argument passing, returning objects, recursion, access control, final, nested and inner classes, string class; **I/O BASICS**: Reading Console Input, Writing Console Output, Files, Applet fundamentals; **INHERITANCE**: basics, super, multilevel hierarchy, overriding, abstract classes, final with inheritance; **PACKAGES AND INTERFACES**: Exception Handling, Multithreaded programming; String Handling, Applet Class, Event Handling; Collections & Generics; **INTRODUCTION TO AWT & SWINGS**: Classes, component, Container, Panel, Window, frame, Canvas, working with frame, working with Graphics, using Swing Controls.

F. Text Books

T1. The Complete Reference (9th Edition), By Herbert Schildt, McGraw Hill Education, ISBN-10:0071808558, ISBN-13: 978-0071808552

G. Reference Books

R1. Core Java Volume I - Fundamentals (10th Edition), By Cay Horstmann, Prentice Hall, ISBN-10:0134177304, ISBN-13: 978-0134177304, Year (2006)

R2. Object Oriented Programming in Java: A Graphical Approach (Preliminary Edition), By KE Sanders and AV Dam, Pearson Education, ISBN-10:0321245741, ISBN-13:978-0321245748, Year (2015)

R3. Java Concepts (4th Edition), Bt Cay horstmann, Wiley India, ISBN-10:0471697044, ISBN-13:978-0471697046, Year (2005)

H. Lecture Plan:

Lec No	Major Topics	Topics	Session outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to Java	Introduction and Course Hand-out briefing	Course objective	Lecture	NA	NA
2		The Creation of Java	About Java	Lecture	2103.1	In Class Quiz
3		How java changed the internet	Java and Internet	Lecture	2103.1	In Class Quiz End Term
4		Java's Magic, The java Buzzwords	About Java	Guided Self-Study	2103.1	Home Assignment End Term
5		An Overview of Java	About Java	Lecture	2103.2	In Class Quiz End Term
6		Arrays	Array and their initialization	Activity	2103.2	Class Quiz Mid Term I End Term
7- 8	Class & Objects	Class fundamentals, Class fundamentals, Declaring objects	Class & Object	Lecture	2103.2	Class Quiz Mid Term I End term
9		Assigning Object reference variable	Object referencing	Lecture	2103.2	Home Assignment Class Quiz Mid Term I End Term
10		Introduction to methods	Member methods	Activity	2103.2	Class Quiz Mid Term I End Term
11		Constructors	Initialization and their use	Lecture	2103.2	Class Quiz Mid Term I End Term
12		this keyword	Various aspects of this keyword	Lecture	2103.2	Class Quiz End Term
13		Garbage collection	De-allocation of memory	Lecture	2103.4	Class Quiz Mid Term II End Term
14		finalize() method	Uses of method	Lecture	2103.4	Class Quiz Mid Term II End Term
15		Overloading	Concept of overloading	Lecture	2103.4	Class Quiz Mid Term II End Term
16-17		Objects as parameters, Argument passing, Returning objects	Object passing	Lecture	2103.4	Class Quiz Mid Term II End Term

18		Recursion	Use of recursion in class & object	Lecture	2103.4	Class Quiz End Term
19		Access control, Final	Use of various access and final keyword	Lecture	2103.4	Class Quiz End Term
20		Nested and inner classes	Uses and their applications	Lecture	2103.4	Class Quiz End Term
21		String class	Uses and their applications	Lecture	2103.4	Class Quiz End Term
22		Reading Console Input, Writing Console Output, Files	Uses and their applications	Lecture	2103.5	Class Quiz End Term
23-24		Applet fundamentals	Introduction	Lecture	2103.5	Class Quiz End term
25-26	Java Concepts and their applications	Inheritance Basic, super, multilevel hierarchy	Uses and their applications	Lecture	2103.5	Class Quiz
27-28		Overriding, abstract classes, final with inheritance	Uses and their applications	Lecture	2103.5	Class Quiz Mid Term II End Term
29		Exception Handling	Uses and their applications	Lecture	2103.3 2103.5	Class Quiz Mid Term II End Term
30-31		Multithreaded programming; String Handling, Applet Class, Event Handling	Uses and their applications	Lecture	2103.3 2103.5	Class Quiz Mid Term II End Term
32		Collections & Generics	Uses and their applications	Lecture	2103.3 2103.5	Class Quiz End Term
33-34		AWT & Swing classes, component, Container	Uses and their applications	Lecture	2103.4 2103.6	Class Quiz End Term
35-36		Panel, Window, frame, Canvas, working with frame	AWT based application development	Lecture	2103.6	Class Quiz End Term
37-38		Working with Graphics	Application development	Lecture	2103.6	Class Quiz End Term
39-41		Swing Controls	Application development	Lecture	2103.6	Class Quiz End Term
42		Revision	Discussion of course outcome	Lecture	NA	NA
LAB SESSIONS	Java & their applications	Lab sessions based on object oriented programming concepts. Applets, AWT and Swing based application development		Lab Sessions	2103.1 - 2103.6	Experimental results 14 lab sessions End Term Practical End Term Theory

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 2103.1	Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface.	3						1			2
CA 2103.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.		2	2							2
CA 2103.3	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.				2	2			3		
CA 2103.4	Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.						2		3		
CA 2103.5	Understand, Learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains for improving employability.			1					3	2	
CA 2103.6	Visualize a real world problem in the form of various collaborating classes and objects or skill development.	3	2	2	2				3	2	

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

J. Course Outcome Attainment Level Matrix

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%							ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 2103.1	Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface.										
CA 2103.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.										
CA 2103.3	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.										
CA 2103.4	Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.										
CA 2103.5	Understand, Learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains for improving employability.										
CA 2103.6	Visualize a real world problem in the form of various collaborating classes and objects or skill development.										

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications
Study Material sharing report through Online mode

Data Communication and Protocols| CA 2104| 4 Credits | 3 1 0 4

Session: July- Dec 2020 | Faculty: Devershi Pallavi Bhatt | Class: BCA- Sem III

A. **Introduction:** This course is offered by Department of Computer application which provides students with the fundamental concepts and techniques used for communicating data in efficient and reliable manner. The student will be able to gain practical understanding of relevant terminology and describe various encoding techniques, flow & error control mechanisms, multiplexing & multiple-access techniques used for enabling data communication. The course lays down the foundation for Computer Networks, Wireless & Mobile Communication and Network security.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CA 2104.1] Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.

[CA 2104.2] Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.

[CA 2104.3] Apply the knowledge of various error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.

[CA 2104.4] Discuss and distinguish between different types of multiplexing techniques and spread spectrum techniques.

[CA 2104.5] Identify and compare various generations of wireless cellular networks.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

E.   SYLLABUS

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity. **Transmission Media**: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission. **Signal Encoding Techniques**: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation, Digital-To-Analog Conversion: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying. **Digital Data Communication Techniques**: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations. **Data Link Control Protocols**: Flow Control, Error Control, High-Level Data Link Control (HDLC). **Multiplexing:** Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA). **Spread Spectrum**: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).**Cellular Wireless Communication Techniques:** Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity. **Transmission Media**: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission. **Signal Encoding Techniques**: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation, Digital-To-Analog Conversion: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying. **Digital Data Communication Techniques**: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations. **Data Link Control Protocols**: Flow Control, Error Control, High-Level Data Link Control (HDLC). **Multiplexing:** Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA). **Spread Spectrum**: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).**Cellular Wireless Communication Techniques:** Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.
Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity. **Transmission Media**: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight

Transmission. **Signal Encoding Techniques**: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation, Digital-To-Analog Conversion: Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying. **Digital Data Communication Techniques**: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations. **Data Link Control Protocols**: Flow Control, Error Control, High-Level Data Link Control (HDLC). **Multiplexing:** Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA). **Spread Spectrum**: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).**Cellular Wireless Communication Techniques:** Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.

References:

1. Stallings W., "Data and Computer Communications", 8th Edition, Pearson Education, 2007.
2. B. Forouzan, "Data Communications & Networking", 5th Edition, McGraw Hill, 2012.
3. T. Bertsekas, K. Dimitri, G. Gallager, T. Robert, "Data Networks", 2nd Edition, Prentice Hall of India, 2011.
4. L. Peterson, T. Davie "Computer Networks: A Systems Approach", 5th Edition, Morgan Kaufmann Publishers, 2012.

F.   Lecture Plan:

Lecture No.	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction to Data Communication	Data, Data Communication, Data Network, Internet	Fundamentals of communication	Lecture	NA	NA
2.		Need of Layered Protocol Architecture (OSI &TCP/IP)	Fundamentals of protocol architecture	Lecture	NA	NA
3.		TCPIP - Layers and its Functioning	Fundamentals of protocol architecture	Lecture & Activity	NA	NA
4.	Data Transmission: Concepts and Terminology	Concepts and Terminology – Simplex, Half-Duplex, Full-Duplex, Frequency, Bandwidth	Concepts of transmissions / Concepts of transmissions / Concepts of transmissions	Lecture	[2104.1]	Class Quiz Mid Term - I End Term
5.		Time Domain and Frequency Domain Concepts, Data Rate	Introduction to data signals / Introduction to data signals / Introduction to data signals	Lecture & Problem Solving Practice	[2104.1]	Class Quiz Mid Term - I End Term
6.	Analog and Digital Data Transmission	Analog and Digital Data and Signals,	Introduction to digital signals / Introduction to digital signals / Introduction to digital signals	Lecture	[2104.1]	Class Quiz Mid Term - I End Term
7.		Analog and Digital Transmission	Introduction to digital signals / Introduction to digital signals	Lecture	[2104.1]	Class Quiz Mid Term - I End Term

			Introduction to digital signals			
8.	Transmission Impairments	Attenuation, Delay Distortion, Noise	Knowledge of data transmission	Lecture & Problem Solving Practice	[2104.1]	Class Quiz Mid Term - I End Term
			Knowledge of data transmission			
			Knowledge of data transmission			
9.	Channel Capacity	Data Rate and Nyquist Bandwidth	Fundamentals of channel capacity	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Fundamentals of channel capacity			
			Fundamentals of channel capacity			
10.		Shannon Capacity Formula	Fundamentals of channel capacity	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Fundamentals of channel capacity			
			Fundamentals of channel capacity			
11.	Transmission Media: Guided Transmission Media	Twisted Pair & CAT Types	Introduction to transmission media	Lecture & Activity	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to transmission media			
			Introduction to transmission media			
12.		Coaxial Cable, Optical Fiber	Introduction to transmission media	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to transmission media			
			Introduction to transmission media			
13.	Wireless Transmission	Antennas , Terrestrial Microwave	Description to wireless transmission	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Description to wireless transmission			
			Description to wireless transmission			
14.		Satellite Microwave, Broadcast Radio, Infrared	Description to wireless transmission	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Description to wireless transmission			
			Description to wireless transmission			
15.	Wireless Propagation	Ground Wave Propagation, Sky Wave Propagation	Introduction to wireless propogation	Lecture & Activity	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to wireless propogation			
			Introduction to wireless propogation			
16.		Line-of-Sight Propagation	Introduction to wireless propagation	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to wireless propogation			
			Introduction to wireless propogation			
17.	Line-of-sight Propagation	Free Space Loss	Concepts of sight propogation	Lecture &	[2104.2]	Class Quiz Mid Term - I End Term
			Concepts of sight propogation			

			Concepts of sight propogation	Problem Solving Practice		
18.		Atmospheric Absorption, Multipath, Refraction	Concepts of sight propogation	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Concepts of sight propogation			
			Concepts of sight propogation			
19.	Signal Encoding Techniques: Digital-To-Digital Conversion	Analog and Digital Signals, Line Coding Schemes: Unipolar, Polar	Introduction to signal encoding	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to signal encoding			
			Introduction to signal encoding			
20.		NRZ & Bipolar – AMI	Introduction to signal encoding	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to signal encoding			
			Introduction to signal encoding			
21.		Biphase – Manchester & Differential Manchester	Introduction to signal encoding	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to signal encoding			
			Introduction to signal encoding			
22.		Modulation Rate and Scrambling Techniques	Introduction to signal encoding	Lecture & Problem Solving Practice	[2104.2]	Class Quiz Mid Term - I End Term
			Introduction to signal encoding			
			Introduction to signal encoding			
23.	Digital Data – Analog Signal	ASK & FSK	Synthesis to digital /analog signals	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Synthesis to digital /analog signals			
			Synthesis to digital /analog signals			
24.		PSK – BPSK	Synthesis to digital /analog signals	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Synthesis to digital /analog signals			
			Synthesis to digital /analog signals			
25.		MFSK	Synthesis to digital /analog signals	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Synthesis to digital /analog signals			
			Synthesis to digital /analog signals			
26.		QAM	Synthesis to digital /analog signals	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Synthesis to digital /analog signals			
			Synthesis to digital /analog signals			
27.	Analog-To-Digital Conversion	Pulse Code Modulation	Fundamentals of data conversion	Lecture &	[2104.2]	Class Quiz Mid Term - I End Term
			Fundamentals of data conversion			

			Fundamentals of data conversion	Problem Solving Practice		
28.		Delta Modulation	Fundamentals of data conversion	Lecture	[2104.2]	Class Quiz Mid Term - I End Term
			Fundamentals of data conversion			
			Fundamentals of data conversion			
29.	Digital Data Communication Techniques	Asynchronous and Synchronous Transmission	Introduction to communication techniques	Lecture	[2104.3]	Class Quiz Mid Term - I End Term
			Introduction to communication techniques			
			Introduction to communication techniques			
30.		Type of Error, Redundancy, Detection Vs Correction	Introduction to communication techniques	Lecture	[2104.3]	Class Quiz Mid Term - II End Term
			Introduction to communication techniques			
			Introduction to communication techniques			
31.		Cyclic Redundancy Check	Introduction to communication techniques	Lecture	[2104.3]	Class Quiz Mid Term - II End Term
			Introduction to communication techniques			
			Introduction to communication techniques			
32.		Polynomials & CRC Architecture	Introduction to communication techniques	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
			Introduction to communication techniques			
			Introduction to communication techniques			
33.		Error Correction and Block Code Principle	Introduction to communication techniques	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
			Introduction to communication techniques			
			Introduction to communication techniques			
34.		Line Configurations	Introduction to communication techniques	Lecture	[2104.3]	Class Quiz Mid Term

			Introduction to communication techniques		- II End Term
			Introduction to communication techniques		
35.		Framing	Fundamentals of data link protocols	Lecture	[2104.3]	Class Quiz Mid Term - II End Term
36.	Data Link Control Protocols	Flow Control - Stop-and-Wait Protocol	Fundamentals of data link protocols	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
37.		Sliding Window	Fundamentals of data link protocols	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
38.		Error Control: Stop-and-Wait ARQ	Fundamentals of data link protocols	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
			Fundamentals of data link protocols			
			Fundamentals of data link protocols			
39.	Data Link Control Protocols	Go-Back-N ARQ	Fundamentals of data link protocols	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
40.		Selective Repeat ARQ	Fundamentals of data link protocols	Lecture & Problem Solving Practice	[2104.3]	Class Quiz Mid Term - II End Term
41.		High-Level Data Link Control (HDLC)	Fundamentals of data link protocols	Lecture	[2104.3]	Class Quiz Mid Term - II End Term
			Fundamentals of data link protocols			
			Fundamentals of data link protocols			
42.		Introduction to Multiplexing	Fundamentals of multiplexing	Lecture	[2104.4]	Class Quiz Mid Term - II End Term
			Fundamentals of multiplexing			
			Fundamentals of multiplexing			
43.	Multiplexing	Frequency Division Multiplexing (FDM)	Fundamentals of multiplexing	Lecture	[2104.4]	Class Quiz Mid Term - II End Term
			Fundamentals of multiplexing			
			Fundamentals of multiplexing			
44.		Time-Division Multiplexing (TDM)	Fundamentals of multiplexing	Lecture & Activity	[2104.4]	Class Quiz Mid Term - II End Term
			Fundamentals of multiplexing			
			Fundamentals of multiplexing			

45.	Spread Spectrum	The Concept of Spread Spectrum	Fundamentals of spectrum Fundamentals of spectrum Fundamentals of spectrum	Lecture	[2104.4]	Class Quiz Mid Term - II End Term
46.		Frequency Hopping Spread Spectrum (FHSS)	Fundamentals of spectrum Fundamentals of spectrum Fundamentals of spectrum	Lecture	[2104.4]	Class Quiz Mid Term - II End Term
47.		Slow and Fast FHSS	Fundamentals of spectrum Fundamentals of spectrum Fundamentals of spectrum	Lecture & Problem Solving Practice	[2104.4]	Class Quiz Mid Term - II End Term
48.		Direct Sequence Spread Spectrum (DSSS)	Fundamentals of spectrum Fundamentals of spectrum Fundamentals of spectrum	Lecture & Problem Solving Practice	[2104.4]	Class Quiz Mid Term - II End Term
49.		Performance Consideration – FHSS and DSSS	Fundamentals of spectrum	Lecture	[2104.4]	End Term
50.		Code Division Multiple Access (CDMA)	Fundamentals of spectrum	Lecture & Problem Solving Practice	[2104.4]	End Term
51.	Cellular Wireless Communication Techniques	Introduction, Generations: 1G, 2G, 3G,	Introduction to wireless communication technique	Lecture	[2104.5]	End Term
52.		4G, and 5G	Introduction to wireless communication technique	Lecture	[2104.5]	End Term

G. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

| CO | STATEMENT | CORRELATION WITH PROGRAM OUTCOMES | | | | | | | | | | | | | | |
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
[CA 2104. 1]	Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.	1	1		1	2		1						2	1	
[CA 2104. 2]	Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.	2	2	1		1								3	1	
[CA 2104. 3]	Apply the knowledge of various error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.	3	2	1		1								2	2	1
[CA 2104. 4]	Distinguish between different types of multiplexing techniques and spread spectrum techniques.	2			1	2								2	1	
[CA 2104. 5]	Identify and compare various generations of wireless cellular networks.	2						1						1	1	

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications
Course Hand-out

Numerical Methods | MA 2210 | 4 Credits | 3 1 0 4

Session: Jan 20 – Jun 20 | Faculty: Anamika Jain | Class: BCA IV SEMESTER

A. **Introduction:** This course aims to discuss basic concept of Numerical Methods. Course is intended to provide the students the experience in solution of Ordinary Differential equations using numerical methods concepts and to emphasize the practical aspects of numerical analysis.

B. **Course Outcomes:** At the end of the course, students will be able to :

[1422.1]. Understand the concept of Numerical Operators.

[1422.2]. Demonstrate the concepts of Interpolation with equal, unequal interval and central differene.

[1422.3]. Analyse the Numerical Integration.

[1422.4]. Solve the algebraic, transcendental and Ordinary differential equations

C   Program Outcomes:

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

 PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

C.   **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.	

D.   **SYLLABUS**

Finite Differences: Definition of operators and derivation of inter-relations among them, Properties of Δ and E (without proof), Factorial notation for positive and negative exponent, Representation of polynomial in factorial notations.

Interpolation with equal intervals: Newton's forward difference formula, Newton's backward difference formula. Interpolation with unequal intervals. **Central Difference Interpolation formula:** Gauss Forward, Gauss Backward, Stirling's formula. **Numerical Integration:** Trapezoidal rule and its geometrical significance, Simpson's one-third rule, Simpson's three-eighth rule. **Solution of algebraic and transcendental equations**: Secant, Regula-Falsi method, Newton-Raphson Method, Iterative method. **Solution of Ordinary differential equations:** Picard method, Taylor series method, Euler methods, Euler's modified method, Runge-Kutta methods.

E.   **TEXT BOOKS**

1. Numerical Methods: R. K. Jain, S.R.K. Iyengar and M.K. Jain

F.   **REFERENCE BOOKS**

1. Numerical Methods using MATLAB: Mathews and Finle
2. Applied Numerical Analysis: Gerald and Whealtey

G. **Lecture Plan:**

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
1.		Introduction to CO, PO, PSO	Understand PO,CO,PSO	Lecture	NA	NA
2.	Finite Differences	Definition of operators	understanding numerical operators	Lecture	1422.1	Mid Term I, Quiz & End Term
3.		Properties of operators	Concept of Operators	Lecture	1422.1	Mid Term I, Quiz & End Term
4.		Factorial notation	concept of factorial	Lecture	1422.1	Mid Term I, Quiz & End Term
5.		Properties of Factorial notation	understanding of Factorial	Lecture	1422.1	Mid Term I, Quiz & End Term
6.		Illustrative examples	class problems	Activity	1422.1	Mid Term I, Quiz & End Term
7.		Quiz-1	evaluation	Activity	1422.1	Mid Term I, Quiz & End Term
8.	Interpolation Formulas	Newton's forward difference formula	understanding of interpolation	Lecture	1422.2	Mid Term II, Quiz & End Term
9.		Illustrative examples	class problems	Activity	1422.2	Mid Term II, Quiz & End Term
10.		Newton's backward difference formula	Understanding basic formulas	Lecture	1422.2	Mid Term II, Quiz & End Term
11.		Illustrative examples		Lecture	1422.2	Mid Term II, Quiz & End Term
12.		Interpolation with unequal intervals	Application of inline and	Lecture	1422.2	Mid Term II, Quiz & End Term
13.		Illustrative examples	class problems	Activity	1422.2	Mid Term II, Quiz & End Term
14.		Quiz-2	evaluation	Activity	1422.2	Mid Term II, Quiz & End Term
15.		Templates	Templates implemantatio	Tutorial	1422.2	Mid Term II, Quiz & End Term
16.	**Central Difference Interpolation formula**	Gauss Forward Formula	understanding Numerical	Lecture	1422.2	Mid Term II, Quiz & End Term
17.		Illustrative examples	class problems	Activity	1422.2	Mid Term II, Quiz & End Term
18.		Gauss Backward	Introduction to c++Operator	Lecture	1422.2	Mid Term II, Quiz & End Term
19.		Illustrative examples	class problems	Activity	1422.2	Mid Term II, Quiz & End Term
20.		Stirling's formula	understanding Numerical problems	Lecture	1422.2	Mid Term II, Quiz & End Term
21.		Illustrative examples	class problems	Activity	1422.2	Mid Term II, Quiz & End Term
22.		Quiz-3	evaluation	Activity	1422.2	Mid Term II, Quiz & End Term
23.	**Numerical Integration**	Trapezoidal rule	concept of Numerical	Lecture	1422.3	Mid Term III, Quiz & End Term
24.		Illustrative examples	class problems	Activity	1422.3	Mid Term III, Quiz & End Term
25.		Simpson's one-third rule	understanding of Numerical Integration	Lecture	1422.3	Mid Term III, Quiz & End Term
26.		Illustrative examples	class problems	Activity	1422.3	Mid Term III, Quiz & End Term
27.		Simpson's three-eighth rule	method of Numerical Integration	Lecture	1422.3	Mid Term III, Quiz & End Term
28.		Illustrative examples	class problems	Activity	1422.3	Mid Term III, Quiz & End Term

29.		Quiz-4	evaluation	Activity	1422.3	Mid Term III, Quiz & End Term
30.		Templates	Templates implemantation	Tutorial	1422.3	Mid Term III, Quiz & End Term
31.	**Solution of algebraic and transcendental equations**	Secant Method	understanding of application of Numerical	Lecture	1422.4	Mid Term IV, Quiz & End Term
32.		Illustrative examples	class problems	Activity	1422.4	Mid Term IV, Quiz & End Term
33.		Regula-Falsi method	method for solving algebraic method	Lecture	1422.4	Mid Term IV, Quiz & End Term
34.		Illustrative examples	class problems	Activity	1422.4	Mid Term IV, Quiz & End Term
35.		Newton-Raphson Method	method for solving algebraic method	Lecture	1422.4	Mid Term IV, Quiz & End Term
36.		Illustrative examples	class problems	Activity	1422.4	Mid Term IV, Quiz & End Term
37.		Iterative method	understanding methods	Lecture	1422.4	Mid Term IV, Quiz & End Term
38.		Illustrative examples	class problems	Activity	1422.4	Mid Term IV, Quiz & End Term
39.		Quiz-5	evaluation	Activity	1422.4	Mid Term IV, Quiz & End Term
40.	**Solution of Ordinary differential equations**	Picard method	understanding Numerical solution of ODE	Lecture	1422.4	Mid Term IV, Quiz & End Term
41.		Illustrative examples	class problems	Activity	1422.4	Mid Term IV, Quiz & End Term
42.		Taylor series method	understanding Numerical	Lecture	1422.4	Mid Term IV, Quiz & End Term
43.		Illustrative examples	class problems	Activity	1422.4	Mid Term IV, Quiz & End Term
44.		Euler methods	understanding Numerical	Lecture	1422.4	Quiz & End Term
45.		Illustrative examples	class problems	Activity	1422.4	Quiz & End Term
46.		Euler's modified method	understanding Numerical	Lecture	1422.4	Quiz & End Term
47.		Illustrative examples	class problems	Activity	1422.4	Quiz & End Term
48.		Runge-Kutta methods.	understanding Numerical solution of ODE	Tutorial	1422.4	Quiz & End Term
49.		Quiz-6	evaluation	Activity	1422.4	Quiz & End Term
50.		Templates	Templates implemantation	Tutorial	1422.4	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
MA 1422.1	Understand the concept of Numerical Operators.		1		1			1									2
MA 1422.2	Demonstrate the concepts of Interpolation with equal and unequal interval.						1							2			
MA 1422.3	Analyse the Numerical Integration.	2			1						2					1	
MA 1422.4	Solve the algebraic, transcendental and Ordinary differential equations								2								

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J.   Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA 1422.1	Understand the concept of Numerical Operators.															
MA 1422.2	Demonstrate the concepts of Interpolation with equal and unequal interval.															
MA 1422.3	Analyse the Numerical Integration.															
MA 1422.4	Solve the algebraic, transcendental and Ordinary differential equations															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Application
Course Hand-out

Computer Organization and Architecture | CA 2101 | 4 Credits | 3 1 0 4

Session: Jul 20 – Dec 20 | Faculty: Pradeep Kumar | Class: BCA III

A.   **Introduction:** This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behaviour of the various functional modules of the computer and how they interact to provide the processing needs of the user. It will cover machine level representation of data, instruction sets, computer arithmetic, CPU structure and functions, memory system organization and architecture, system input/output, multiprocessors, and digital logic. The emphasis is on studying and analysing fundamental issues in architecture design and their impact on performance.

B.   **Course Outcomes:** At the end of the course, students will be able to

[2101.1] conceptualize the basics of organizational and architectural issues of a digital computer.

[2101.2] Design the concept of memory organization that uses banks for different word size operations.

[2101.3] create an assembly language program to program a microprocessor system.

[2101.4] Compare the generations of Computer with their advancements.

[2101.5] analyse the processor performance improvement using instruction level parallelism.

C.   PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

 PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	20
	Sessional Exam II	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

General Computer Architecture: Block Diagram of typical Computer, Memory Section, Input/Output Section, CPU, Registers, Arithmetic Unit, Instruction handling Areas, Stacks. Micro operations: Register Transfer, Bus and Memory Transfer, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shit Unit. Basic Computer Organization and Design: Instruction Codes,Operation code, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input Output Instructions and Interrupts. Control Memory: Control Word, Microinstruction, Microprogramming, Control Memory, Hardwired Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC, CISC Pipelining and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing, Array Processors Input Output Organization: I/O Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, IOP, Serial Communication. Memory Organization: Associative Memory, Cache Memory, And Virtual Memory Introduction to Microprocessor: Machine Language, Assembly Language, Assembler, High Level Language, Compiler, Interpreter, Internal Architecture 8085.

F. TEXT BOOKS

1. Carl Hammacher, "Computer Organization" (5th Edition), TMH, 2011.

G. REFERENCE BOOKS

1. M.M. Mano, "Computer System Architecture", PHI, 2009.

2. Govindarajalu, "Computer Architecture and Organization", (2nd Edition), TMH, 2008.

H. Lecture Plan:

Lecture No.	Main Topics	Topic	Session outcome	Mode of delivery	Corresponding CO	Mode Of Assessing CO
1	General Computer Architecture	Introduction to computer Organization	Understanding of CO PO,PSO	Lecture	2101.1	Mid Term I, Quiz & End Term
2		Input/output Section,	Introduction to I/O architecture	Lecture	2101.1	Mid Term I, Quiz & End Term
3		CPU	Introduction to architecture	Lecture	2101.1	Mid Term I, Quiz & End Term
4		Registers	Introduction to architecture	Lecture	2101.1	Mid Term I, Quiz & End Term
5		Arithmetic Unit	Knowledge of arithmetic unit	Lecture	2101.1	Mid Term I, Quiz & End Term
6		Instruction handling Areas	Introduction to handling Areas	Lecture	2101.1	Mid Term I, Quiz & End Term
7		Stacks	Synthesis of Computer organisation	Lecture	2101.1, 2101.2	Mid Term I, Quiz & End Term
8		Micro operations: Register Transfer	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term
9		Bus and Memory Transfer	Knowledge of Data transfer	Lecture	2101.1, 2101.2	Mid Term I, Quiz & End Term
10		Arithmetic Micro operations	Synthesis of Computer organisation	Flipped Class	2101.1, 2101.3	Mid Term I, Quiz & End Term
11		Logic Micro operations	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term
12		Shift Micro operations	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term

13		Arithmetic Logic Shit Unit	Synthesis of Computer organisation	Lecture	2101.1, 2101.3	Mid Term I, Quiz & End Term
14	Basic Computer Organization and Design:	Instruction Codes	Introduction to Computer Design	Lecture	2101.3	Mid Term I, Quiz & End Term
15		Operation code	Synthesis of Computer Design	Lecture	2101.3	Mid Term I, Quiz & End Term
16		Timing and Control	Synthesis of computer design	Lecture	2101.3	Mid Term I, Quiz & End Term
17		Instruction Cycle	Knowledge of Computer organisation	Lecture	2101.3	Mid Term I, Quiz & End Term
18		Memory Reference Instructions	Knowledge of Computer organisation	Lecture	2101.2, 2101.3	Mid Term I, Quiz & End Term
19		Input Output Instructions	Knowledge of Computer organisation	Flipped Class	2101.3	Mid Term I, Quiz & End Term
20		Interrupts	Knowledge of Computer organisation	Lecture	2101.3	Mid Term I, Quiz & End Term
21		Tutorial	Synthesis of computer design	Activity	2101.2, 2101.3	Mid Term I, Quiz & End Term
22	Control Memory	Control Word	Introduction to control memory	Lecture	2101.2	Mid Term II, Quiz & End Term
23		Microinstruction	Introduction to control memory	Lecture	2101.3	Mid Term II, Quiz & End Term
24		Microprogramming	Synthesis of control memory	Lecture	2101.3	Mid Term II, Quiz & End Term
25		Control Memory	Synthesis of control memory	Lecture	2101.2, 2101.3	Mid Term II, Quiz & End Term
26		Hardwired	Knowledge of control memory	Lecture	2101.3	Mid Term II, Quiz & End Term
27	Central Processing Unit	General Register Organization	Introduction to CPU	Lecture	2101.1	Mid Term II, Quiz & End Term
28		Stack Organization	Knowledge of CPU	Lecture	2101.2	Mid Term II, Quiz & End Term
29		Instruction Formats	Analyze CPU	Lecture	2101.3	Mid Term II, Quiz & End Term

30		Addressing Modes	Analyze CPU	Lecture	2101.3	Mid Term II, Quiz & End Term
31		RISC and CISC	Analyze CPU	Lecture	2101.4	Mid Term II, Quiz & End Term
32	Pipelining and Vector Processing	Parallel Processing	Introduction to Pipelining	Lecture	2101.4,2101.5	Mid Term II, Quiz & End Term
34		Pipelining and Arithmetic Pipeline	Knowledge of pipeline	Lecture	2101.4, 2101.5	Mid Term II, Quiz & End Term
35		Instruction Pipeline	Synthesize piling	Flipped Class	2101.4, 2101.5	Mid Term II, Quiz & End Term
36		Vector Processing, Array Processors	Introduction to Vector Processing	Lecture	2101.4	Mid Term II, Quiz & End Term
37		Tutorial	Synthesize piling and VP	Activity	2101.4	Mid Term II, Quiz & End Term
38	Input Output Organization	I/O Interface	Introduction to Interface	Lecture	2101.4	Mid Term II, Quiz & End Term
39		Asynchronous Data Transfer	Application of I/O	Lecture	2101.2, 2101.4	Mid Term II, Quiz & End Term
40		Modes of Transfer	Application of I/O	Lecture	2101.4	Mid Term II, Quiz & End Term
41		Priority Interrupt	Application of I/O	Lecture	2101.4	Quiz & End Term
42		DMA	Application of I/O	Lecture	2101.4	Quiz & End Term
43		IOP	Synthesize I/O	Lecture	2101.4	Quiz & End Term
44		Serial Communication	Application of I/O	Lecture	2101.4	Quiz & End Term
45	Memory Organization	Associative Memory	Knowledge of Memory Organization	Lecture	2101.2	Quiz & End Term
46		Cache Memory	Knowledge of Memory Organization	Lecture	2101.2	Quiz & End Term
47		Virtual Memory	Knowledge of Memory Organization	Lecture	2101.2	Quiz & End Term
48	Introduction to Microprocessor	Machine Language and Assembly Language	Introduction to microprocessor	Lecture	2101.3	Quiz & End Term
49		Assembler, High Level Language	Introduction to microprocessor	Lecture	2101.1, 2101.3	Quiz & End Term

50		Compiler, Interpreter	Knowledge of Microprocessor	Flipped Class	2101.1, 2101.3	Quiz & End Term
51		Internal Architecture 8085.	Knowledge of Microprocessor	Lecture	2101.3	Quiz & End Term
52		Tutorial	Synthesize Microprocessor	Activity	2101.1, 2101.3	Quiz & End Term

C. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 2101.1	Conceptualize the basics of organizational and architectural issues of a digital computer		3						1						2	
CA 2101.2	Design the concept of memory organization that uses banks for different word size operations		2	2											2	
CA 2101.3	Create an assembly language program to program a microprocessor system.				2	3								3		
CA 2101.4	Compare the generations of Computer with their advancements.		3													1
CA 2101.5	Analyse the processor performance improvement using instruction level parallelism.				2										1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

D. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 2101.1	Conceptualize the basics of organizational and architectural issues of a digital computer															
CA 2101.2	Design the concept of memory organization that uses banks for different word size operations															
CA 2101.3	Create an assembly language program to program a microprocessor system.															
CA 2101.4	Compare the generations of Computer with their advancements.															
CA 2101.5	Analyse the processor performance improvement using instruction level parallelism.															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Bachelor of Computer Application

Python Programming | CA 2202 | 4 Credits | 3 1 0 4
Session: Jan – May 21 | Faculty: Dr. Timothy Malche| Class: BCA IV SEMESTER

Introduction: The main objective of this course is to teach students the fundamentals and advance features of python programming language and enable them to build analytical & problem solving skills. The course covers concept of python programming from beginner to advance level and intended to make student expert in solving real world problems using python programming. Students will spend a significant time on each topic to understand their essential requirements and to use them differently with distinct programmable problems.

A. Course Outcomes: At the end of the course, students will be able to

[CA2202.1]. Learn basic Python programming constructs as well as learn to write, test and debug Python Programs.
[CA2202.2]. Implement Conditional and Looping statements in Python Programs.
[CA2202.3]. Learn data structures such as list, set, dictionary, tuple, graph.
[CA2202.4]. Write reusable programs using functions.
[CA2202.5]. Learn to use various Python libraries for String and Text Handling, Data Structures and Algorithms, Threading, Networking, Web Programming, Graphical Programming, Database Access.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES
[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.
[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.
[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

Program Specific Outcomes
[PSO1] Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.
[PSO2] Encourage to communicate effectively and to improve their competency skills to solve real time problems.
[PSO3] Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

B. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

C. Syllabus

Python concepts: Expressions, values, types, variables, programs & algorithms, control flow, file I/O, the Python execution model. Data structures: List, set, dictionary (mapping), tuple, graph (from a third-party library), List slicing (sublist), list comprehension (shorthand for a loop), Mutable and immutable data structures, Distinction between identity and (abstract) value. Functions: Procedural abstraction, functions as values, recursion, function design methodology. The Python Library: String and Text Handling, Data Structures and Algorithms, Threading, Networking, Web Programming, Graphical Programming, Database Access

D. Textbooks

1. David M. Beazley, "Python Essential Reference", Amazon Books, 2010

E. Reference books

1. M. Lutz, "Programming Python, 4th Edition", O'Reilly Media, 2010

Lecture Plan:

LEC NO	Major Topic	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Accessing CO
1	Python concepts	Introduction to python	understand python programming	Lecture	CA2202.1	Mid Term I, Quiz & End Term
2		Introduction to python	understand python programming	Lecture	CA2202.1	Mid Term I, Quiz & End Term
3		Expressions, values, types	understand python programming	Lecture	CA2202.1	Mid Term I, Quiz & End Term
4		variables, programs & algorithms	understand python programming	Lecture	CA2202.1	Mid Term I, Quiz & End Term
5		control flow	Understand Control Flow	Lecture	CA2202.2	Mid Term I, Quiz & End Term
6		control flow	Understand Control Flow	Lecture	CA2202.2	Mid Term I, Quiz & End Term
7		file I/O	Understand File I/O	Lecture	CA2202.2	Mid Term I, Quiz & End Term

8		file I/O	Understand File I/O	Flipped Class	CA2202.2	Mid Term I, Quiz & End Term
9		Python execution model	Understand execution of python	Lecture	CA2202.2	Mid Term I, Quiz & End Term
10	Data structures	List	Understand List	Lecture	CA2202.3	Mid Term I, Quiz & End Term
11		Set	Understand Set	Lecture	CA2202.3	Mid Term I, Quiz & End Term
12		dictionary (mapping)	Understand dictionary	Lecture	CA2202.3	Mid Term I, Quiz & End Term
13		Tuple	Understand tuple	Lecture	CA2202.3	Mid Term I, Quiz & End Term
14		Graph	Understand graph	Lecture	CA2202.3	Mid Term I, Quiz & End Term
15		List slicing (sublist)	Understand list slicing	Lecture	CA2202.3	Mid Term I, Quiz & End Term
16		list comprehension	Understand list comprehension	Lecture	CA2202.3	Mid Term I, Quiz & End Term
17		Mutable and immutable data structures	Understand Mutable and immutable data structures	Lecture	CA2202.3	Mid Term I, Quiz & End Term
18		Distinction between identity and (abstract) value	Understand Distinction between identity and (abstract) value	Lecture	CA2202.3	Mid Term I, Quiz & End Term
19	Functions	Procedural abstraction	Understand Procedural abstraction	Lecture	CA2202.4	Mid Term I, Quiz & End Term
20		functions as values	Understand functions as values	Lecture	CA2202.4	Mid Term I, Quiz & End Term

21		Recursion	Understand Recursion	Lecture	CA2202.4	Mid Term I, Quiz & End Term
22		function design methodology	Understand function design methodology	Lecture	CA2202.4	Mid Term I, Quiz & End Term
23	The Python Library	String and Text Handling	Understand String and Text Handling	Lecture	CA2202.5	Mid Term I, Quiz & End Term
24		String and Text Handling	Understand String and Text Handling	Lecture	CA2202.5	Mid Term I, Quiz & End Term
25		String and Text Handling	Understand String and Text Handling	Lecture	CA2202.5	Mid Term II, Quiz & End Term
26		Data Structures and Algorithms	Understand Data Structures and Algorithms	Lecture	CA2202.5	Mid Term II, Quiz & End Term
27		Data Structures and Algorithms	Understand Data Structures and Algorithms	Lecture	CA2202.5	Mid Term II, Quiz & End Term
28		Data Structures and Algorithms	Understand Data Structures and Algorithms	Flipped Class	CA2202.5	Mid Term II, Quiz & End Term
29		Data Structures and Algorithms	Understand Data Structures and Algorithms	Flipped Class	CA2202.5	Mid Term II, Quiz & End Term
30		Threading	Understand Threading	Lecture	CA2202.5	Mid Term II, Quiz & End Term
31		Threading	Understand Threading	Lecture	CA2202.5	Mid Term II, Quiz & End Term
32		Threading	Understand Threading	Lecture	CA2202.5	Mid Term II, Quiz & End Term
33		Networking	Understand Networking	Lecture	CA2202.5	Mid Term II, Quiz & End Term
34		Networking	Understand Networking	Lecture	CA2202.5	Mid Term II, Quiz & End Term

35		Networking	Understand Networking	Flipped Class	CA2202.5	Mid Term II, Quiz & End Term
36		Web Programming	Understand Web Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
37		Web Programming	Understand Web Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
38		Web Programming	Understand Web Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
39		Web Programming	Understand Web Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
40		Web Programming	Understand Web Programming	Flipped Class	CA2202.5	Mid Term II, Quiz & End Term
41		Graphical Programming	Understand Graphical Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
42		Graphical Programming	Understand Graphical Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
43		Graphical Programming	Understand Graphical Programming	Lecture	CA2202.5	Mid Term II, Quiz & End Term
44		Graphical Programming	Understand Graphical Programming	Flipped Class	CA2202.5	Mid Term II, Quiz & End Term
45		Database Access	Understand Database Access	Lecture	CA2202.5	Mid Term II, Quiz & End Term
46		Database Access	Understand Database Access	Lecture	CA2202.5	Mid Term II, Quiz & End Term
47		Database Access	Understand Database Access	Lecture	CA2202.5	Mid Term II, Quiz & End Term
48		Database Access	Understand Database Access	Flipped Class	CA2202.5	Mid Term II, Quiz & End Term

I Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7					PSO1	PSO2	PSO3	
CO1	Learn basic Python programming constructs as well as learn to write, test and debug Python Programs.	2	1	2		1	1	1					1	1	1	
CO2	Implement Conditional and Looping statements in Python Programs.	2	1	1				1					2		1	
CO3	Learn data structures such as list, set, dictionary, tuple, graph.	2	1	1				1					2		1	
CO4	Write reusable programs using functions.	2		1				1					2	1	1	
CO5	Learn to use various Python libraries for String and Text Handling, Data Structures and Algorithms, Threading, Networking, Web Programming, Graphical Programming, Database Access.	3	1	1		1	1	3					3	1	2	

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

SCHOOL OF BASIC SCIENCE

DEPARTMENT OF COMPUTER APPLICATIONS

COURSE HAND-OUT

Software Engineering | CA 2203 | 4 Credits | 3 1 0 4

Session: Jan – May 21 | Faculty: Dr Sumegh Tharewal | Class: BCA IV Sem

A. **Introduction:** This course provides a general introduction to software engineering. It introduces concepts such as software system, characteristics and its types, and software development life cycle, from initial specification through to system maintenance. Various software development models will be covered such as Waterfall model, Prototype model and evolutionary development models. Formalisms and tools to assist in software development are also presented, including Data Flow Diagrams, E-R notation, and structured design tools. There is a focus on software testing, from unit testing to the testing of software releases. Case studies provide practical examples for many of these concepts.

B. **Course Outcomes:** At the end of the course, students will be able to:

[2203.1]. To improve the software process; assist in planning, tracking and control of software project; and asses the quality of product that is produced.

[2203.2]. To integrate process, methods, and tools for the development of computer software

[2203.3]. To follow the design principles and concepts as the design process proceed

[2203.4]. To conduct strategic test plans to meet test objectives: to find and remove errors in an orderly and effective manner.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1].   Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2].   Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3].   Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4].   Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5].   Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

[PO.6].   Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7].   Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8].   Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9].   Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. <u>Communicate effectively</u> on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. Recognize the need for and have the preparation and ability to engage in independent and <u>life-long learning</u> in the broadest context of technological change.

[PSO.1.] Cultivate an ability to apply knowledge of mathematics, computer science and management in practice.

[PSO.2.] Prepare the young professional for a range of computer applications' latest technologies.

[PSO.3.] Clarity on both conceptual and application-oriented skills of Computer Applications in Business context.

[PSO.4.] Understand techniques to enhance ability for lifelong learning.

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. SYLLABUS

Introduction to System Concepts: Definition, Elements of System, Characteristics of System, Types of System, System Concepts. **Introduction to Software Engineering:** Definition, Need for software Engineering, Software Characteristics, Software Qualities (McCall's Quality Factors) **Requirement Analysis:** Definition of System Analysis, Requirement Anticipation, Knowledge and Qualities of System Analyst, Role of a System Analyst, Feasibility Study And It's Types, User Transaction Requirement, User design Requirements, SRS(System Requirement Specification) **Software Development Methodologies:** SDLC (System Development Life Cycle), Waterfall Model, Spiral Model, Prototyping Model. **Analysis and Design Tools:** Entity-Relationship Diagrams, Data Flow Diagrams (DFD), Data Dictionary & Elements of Data Dictionary, Pseudo code, Input and Output Design. **Structured System Design:** Modules Concepts and Types of Modules, Structured Chart, Qualities of Good Design, Coupling, Types of Coupling, Cohesion, Types of Cohesion. **Software Testing:** Definition, Test characteristics, Types of testing - Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing

E. TEXT BOOKS

- Roger S. Pressman, *"Software Engineering"*, Tata McGraw Hills, 5th Edition, 2009.
- Ian Sommerville, *"Software Engineering"*, Pearson Education Asia, 6th Edition, 2005.

F. REFERENCE BOOKS

- Pankaj Jalote, *"An Integrated Approach to Software Engineering"*, Springer Publications, 2010.

G.   Lecture Plan:

Lectures	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1-2	**Introduction to System Concepts**	Definition, Elements of System, Characteristics of System, System	Understanding Cos, Pos and PSOs	Lecture	CA **2203** .1	Mid Term I, Assignment/Quiz
3-4		Types of System	Defining System and types	Practice	CA **2203** .1	Mid Term I, Assignment/Quiz
5-6.	**Introduction to Software Engineering**	Definition, Need for software Engineering, Software Characteristics,	Recognizing need of Software Engineering	Lecture	CA **2203** .2	Mid Term I, Assignment/Quiz
7-8.		Software Qualities (McCall's Quality Factors)	Identifying quality attributes	Lecture	CA **2203** .2	Mid Term I, Assignment/Quiz
9-11		Definition of System Analysis, Requirement Anticipation, Knowledge and Qualities of System	Understanding Requirements and analysis	Lecture	CA **2203** .2	Mid Term I, Assignment/Quiz
12-14		Feasibility Study and It's Types	Comprehend feasibility	Lecture	CA**2203**.2	Mid Term I, Assignment/Quiz
15		User Transaction Requirement, User design Requirements	Introducing requirements	Lecture	CA **2203** .2	Mid Term I, Assignment/Quiz
16-17		SRS(System Requirement Specification)	Creating SRS	Activity	CA **2203** .2	Mid Term I, Assignment/Quiz
18	**Software Development Methodologi**	SDLC (System Development Life Cycle)	Defining SDLC	Lecture	CA **2203** .3	Mid Term II, Assignment/Quiz
19		Waterfall Model	Understanding Waterfall model	Lecture and Activity	CA **2203** .3	Mid Term II, Assignment/Quiz
20		Prototyping Model	Identify with prototyping	Lecture and Activity	CA **2203** .3	Mid Term II, Assignment/Quiz

		Spiral Model	Recognize Spiral model need	Lecture and Activity	CA 1501 .3	Mid Term II, Assignment/Quiz
21						
22-24	**Analysis and Design Tools**,	Entity-Relationship Diagrams,	Creating ER model	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
25-27		Data Flow Diagrams (DFD)	Creating DFD	Lecture	CA 1501 .3	Mid Term I, Assignment/Quiz
28		Data Dictionary & Elements of Data Dictionary, Pseudo code	Understanding data dictionary	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
29-30		Input and Output Design	Understanding I/O designs	Activity	CA 1501 .3	Mid Term II, Assignment/Quiz
31-32	**Structured System Design**	Modules Concepts and Types of Modules	Applying module concepts	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
33		Structured Chart	Implementing SC	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
34		Qualities of Good Design	Understanding quality design	Lecture	CA 1501 .3	Assignment/Quiz & End Term
35-38.		Coupling, Types of Coupling, Cohesion, Types of Cohesion	Identifying cohesion and coupling	Practice	CA 1501 .3	Assignment/Quiz & End Term
39.	**Software Testing**	Definition, Test characteristics	Understanding testing	Lecture	CA 1501 .4	Assignment/Quiz & End Term
40-41		Types of testing - Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing	Identify types of testing	Lecture	CA 1501 .4	Assignment/Quiz & End Term
42-43.		Black-Box Testing	Understanding black	Activity	CA 1501 .4	Assignment/Quiz & End Term
44-45.		**White-Box Testing**	Understanding white box testing	Activity	CA 1501 .4	Assignment/Quiz & End Term

| 46-48 | Revision and Problem-Solving classes | Revision and Problem-Solving classes | Revision and Problem-Solving classes | Discussion | CA 1501 .4 | Assignment/Quiz & End Term |

H. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CA 2203 .1	To improve the software process; assist in planning, tracking and control of software project; and asses the quality of product that is produced	1		1	3	1	2	1	2	3	2	1	1	1	3	1	
CA 2203 .2	To integrate process, methods and tools for the development of computer software	2		1	2	1	1			1	2	2	1	2	3	2	1
CA 2203 .3	To follow the design principles and concepts as the design process proceed	2	1		3	1			1			2		2	3		1
CA 2203 .4	To conduct strategic test plans to meet test objectives: to find and remove errors in an orderly and effective manner	2	2	3	2	1	2			2		1		1		2	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

I. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 2203.1	To improve the software process; assist in planning, tracking and control of software project; and asses the quality of product that is produced															
CA 2203.2	To integrate process, methods, and tools for the development of computer software															
CA 2203.3	To follow the design principles and concepts as the design process proceed															
CA 2203.4	To conduct strategic test plans to meet test objectives: to find and remove errors in an orderly and effective manner															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

Faculty of Science

School of Basic Sciences

Department of Chemistry
Course Hand-out

Environmental Science| CY 1003 | 3 Credits | 3 0 0 3

Session: Feb 21 – May 21| Faculty: Dr. Naveen Kumar Singh | Class: B. C.A. | Semester IV

A. **Introduction:** This course is offered by Dept. of Chemistry as a Compulsory Course, targeting students who are studying in undergraduate courses of higher education of all branches including Science, Arts, Social Sciences, Design, Business and Commerce, Journalism and Mass Communication. Offers the knowledge of how natural world works, Environmental and natural processes which effects humans and how human activities and developmental processes change the environment and natural systems. Conservation of nature and natural resources, ecosystems and their services, biodiversity loss and its conservation, environmental pollution, effects and control, environmental policies and practices, human communities and the environment. Students are expected to have basic knowledge of science and social sciences for a better learning.

B. **Course Outcomes:** At the end of the course, students will be able to

[1003.1] Remember environmental components and their processes to make aware and sensitive.

[1003.2] Understand environmental problems concerning with human activities and developmental processes.

[1003.3] Acquire skills for identifying and solving environmental problems.

[1003.4] Apply strategies for conservation of nature and natural resources and to solve the emerging problems related to environmental degradation.

[1003.5] Evaluate physical and chemical processes required for environmental sustainability.

[1003.6] Design developmental plans and strategies in the perspective of sustainable development.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

[PO3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

[PO4]. Effective Citizenship: Demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio technological changes.

[PSO.1]: To Recognize and apply the fundamental concepts of chemistry and their applications.

[PSO.2]: To Employ critical thinking and scientific inquiry in the interpretation of theoretical knowledge at a level suitable to succeed at an entry-level position in chemical industry or a post graduate chemistry program.

[PSO.3]: Understand the applications of chemical sciences in the areas of organic synthesis, synthesis of materials, corrosion inhibition, environment sustainability etc.

D.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E.   SYLLABUS

INTRODUCTION Multidisciplinary Nature of Environmental Studies, Scope and importance, concept of sustainability and sustainable development **ECOSYSTEMS** Concept, structure and function, energy flow in an ecosystem, food chain, food webs and ecological succession, examples. **NATURAL RESOURCES (RENEWABLE & NON RENEWABLE RESOURCES)** Land Resources and land use change, Land degradation, soil erosion and desertification; Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies **BIODIVERSITY AND CONSERVATION** Levels, Biogeographic zones ,Biodiversity patterns and hot spots, India as a mega-biodiversity nation; Endangered and endemic species, threats, conservation, biodiversity services **ENVIRONMENTAL POLLUTION** type, causes, effects, and controls of Air, Water, Soil and Noise pollution, Nuclear hazards and human health risks, ill effects of fireworks, Solid waste management, case studies **ENVIRONMENTAL POLICIES & PRACTICES** Climate change, global warming, ozone layer depletion, acid rain, Environment laws, International agreements, nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context **HUMAN COMMUNITIES AND THE ENVIRONMENT** Human population growth, human health and welfare, Resettlement and rehabilitation, case studies, Disaster management, Environmental ethics, Environmental communication and public awareness, case studies, Field work and visit.

F.   TEXT BOOKS

T1. Rajagopalan, R., Environmental Studies: From Crisis to Cure, Oxford University Press, 2016.

T2. De, A. K. *Environmental Studies*, New Age International Publishers, New Delhi, 2007.

T3. Bharucha, E., *Text book of Environmental Studies for undergraduate courses*, Universities Press, Hyderabad, 2nd Edition, 2013.

G.   REFERENCE BOOKS

R1. Gadgil, M., & Guha, R. *This Fissured Land: An Ecological History of India*. Univ. of   California, Press, 1993.

R2. Carson, R. *Silent Spring*. Houghton Mifflin Harcourt, 2002.

R3. Groom, Martha J., Gary, K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.

R4. Singh, J.S., Singh, S.P., Gupta, S.R. Ecology, Environmental Science and conservation. S. Chand Publishing, New Delhi, 2014.

R5. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). *Conservation Biology: Voices from the Tropics. John Wiley & Sons,* 2013.

H.   Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to Environmental Studies: multidisciplinary nature of environmental studies	Explain about environment and its processes and to interpret as multidisciplinary subject	Lecture	1003.1	In Class Quiz Mid Term I End Term
2	Scope and importance, concept of sustainability and sustainable development	Recall concept of sustainability, Explain sustainable development, Scope and importance of environmental science	Lecture	1003.1	Mid Term I End Term
3,4	Ecosystem: concept, structure and function, Energy flow in an ecosystem, food chain, food webs	Explain ecosystem with structure, flow of energy, nutrients cycling in the ecosystem, food chain and food webs	Lecture	1003.1	In Class Quiz Mid Term I End Term
5,6	Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem (Ponds, Streams, Lakes, River, Oceans, Estuaries)	Explain different type ecosystem with examples of terrestrial and aquatic ecosystem and their importance	Lecture	1003.1	In Class Quiz Mid Term I End Term
7.8	Ecological succession, Natural Resources (Renewable & Non Renewable Resources): Land Resources and land use change, Land degradation	Recall Ecological succession and its type, Explain different Natural Resources including Land Resources and land use change	Lecture	1003.1	In Class Quiz Mid Term I End Term
9	Soil erosion and desertification	Recall soil degradation by erosion and desertification	Lecture	1003.2	Mid Term I End Term
10	Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations	Recall Deforestation processes and their impact on the environment and biodiversity	Lecture	1003.2	Mid Term I End Term
11	Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).	Recall distribution and consumption pattern of water across the world and its related environmental issues including overexploitation and conflicts	Lecture	1003.2	In Class Quiz Mid Term I End Term

12	Energy resources: Renewable and Non-renewable energy sources	Recall different Energy resources including coal, oil, nuclear and their environmental impacts on the environment and on human health	Lecture	1003.2	Mid Term I End Term
13	Use of alternate energy sources	Explain other energy resources including solar, water, wind, geothermal and hydrogen energy for sustainability.	Lecture	1003.2	Mid Term I End Term
14	Growing energy needs, case studies	Recall energy demand and supply in different sector and their environmental concern	Lecture	1003.2	Mid Term I End Term
15,16	Biodiversity and conservation: Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India	Recall different variety and variability of plants and animals Explain different type of biodiversity and Biogeographic zones of India	Lecture	1003.3	In Class Quiz Mid Term II End Term
17	Biodiversity patterns and global biodiversity hot spots	Compare biodiversity at national and global level and ecological hotspots for their respective biodiversity	Lecture	1003.3	Mid Term II End Term
18	India as a mega-biodiversity nation; Endangered and endemic species of India	Recall different mega-diversity nation including India Describe different Endangered and endemic species of India	Lecture	1003.3	Mid Term II End Term
19	Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions	Explain biodiversity loss and their reasons, Explain biological invasive species and their impact on biodiversity	Lecture	1120.3	Mid Term II End Term
20	Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and informational value	Explain the goods and services provided by biodiversity and the ecosystem	Lecture	1003.4	Mid Term II End Term
21	Conservation of biodiversity: *In-situ* and *Ex-situ*	Explain different measures of conservation of biodiversity, Description of National parks, wildlife sanctuaries etc.	Lecture	1003.4	Mid Term II End Term
22	Environmental pollution: type, causes, effects, and controls of Air Pollution	Recall air pollution and their effects and explain different air pollutants and their impacts on environment and human health	Lecture	1003.5	Mid Term II End Term

23	ill effects of fireworks , Controls of Air Pollution	Describe harmful impact of fireworks and control methods of air pollutants like ESP, Scrubber	Lecture	1003.5	Mid Term II End Term
24	Type, causes, effects of Water Pollution	Describe water pollutants and their effects, BOD, COD, water quality parameters, DO, TSS	Lecture	1003.5	Mid Term II End Term
25	Controls of Water Pollution	Describe conventional and advance methods for prevention and control of water pollution	Lecture	1003.5	Mid Term II End Term
26	Causes, effects of Soil and Noise Pollution, Nuclear hazards and human health risks	Explain the Causes, effects of Soil and Noise Pollution, Nuclear hazards and human health risks	Lecture	1003.5	Mid Term II End Term
27	Solid waste management: control measures of urban and industrial waste, Pollution case studies,	Describe different type of solid waste and their methods of management	Lecture	1003.5	Mid Term II End Term
28,29	Environmental Policies & Practices: Climate change and global warming, International agreements: Kyoto protocols and Convention on Biological Diversity (CBD)	Recall of environmental pollution with some case studies, Describe sources and effects of greenhouse gases in global warming and climate change and their environmental impact, Explain different treaties for reduction of greenhouse gases and conservation of biodiversity	Lecture	1003.6	Mid Term II End Term
30,31	Ozone layer depletion, Montreal protocols, Acid rain and impacts on human communities and agriculture	Explain the importance of ozone layer and causes of its depletion, control measures, Describe the Acid Rain with its effects and control	Lecture	1003.6	In Class Quiz End Term
32,33	Environment laws; Water (Prevention and control of Pollution) Act, Air (Prevention and Control of Pollution) Act, Environmental Protection Act,	Describe the provision of Water Act, 1974, Air Act, 1981for prevention and control of water and air pollution, Explain EPA, 1986	Lecture	1003.6	End Term
34,35	Wildlife Protection Act, Forest Conservation Act; Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context, Human	Describe the provision of Wildlife Protection Act, Forest Conservation Act, Explain Nature reserves, tribal populations and rights, and	Lecture	1003.6	In Class Quiz End Term

	communities and the Environment: Human population growth: impact on environment	human wildlife conflicts in Indian context, impact of population growth on environment			
36, 37	Human health and welfare, Resettlement and rehabilitation of project affected persons; case studies, Disaster management: flood, earthquake, cyclone and landslides	Explain human health with respect to environment, measures of disaster management, Describe natural disasters and their impact	Lecture	1003.6	In Class Quiz End Term
38	Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan,	Describe different movement in Indian continents for conserve environment and their socio-economic importance	Lecture	1003.6	End Term
39, 40	Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Revision on Ecosystem and Natural Resources	Describe role of ethics in preservation and conservation of environment, environmental awareness programme, green enrgy concept and revision	Lecture	1003.6	End Term
41-42	Revision on Biodiversity & Conservation, Environment Pollution and Environmental Policies	Revision for preparation for end term exam	Lecture	1003.6	Class quiz End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES								CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7		PSO 1	PSO 2	PSO 3
CY 1003.1	Remember environmental components and their processes to make aware and sensitive.		1	3			3	2		1	1	1
CY 1003.2	Understand environmental problems concerning with human activities and developmental processes.	2		1	1	2	3	2				2
CY 1003.3	Acquire skills for identifying and solving environmental problems.		1	2	2		3			2	2	
CY 1003.4	Apply strategies for conservation of nature and natural resources and to solve the emerging problems related to environmental degradation.	3				2	3	3		1	1	1
CY 1003.5	Evaluate physical and chemical processes required for environmental sustainability	3	2	1	1	3	3	2		3	3	1
CY 1003.6	Design developmental plans and strategies in the perspective of sustainable development.	2	1	2	1	3	3	2		3	1	2

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

SCHOOL OF BASIC SCIENCE

DEPARTMENT OF COMPUTER APPLICATIONS

COURSE HAND-OUT

Software Engineering | CA 1501 | 4 Credits | 3 1 0 4

Session: Aug20 – Nov 20 | Faculty: Dr. Shilpa Kulkarni Sharma | Class: BCA V

A. **Introduction:** This course provides a general introduction to software engineering. It introduces concepts such as software system, characteristics and its types, and software development life cycle, from initial specification through to system maintenance. Various software development models will be covered such as Waterfall model, Prototype model and evolutionary development models. Formalisms and tools to assist in software development are also presented, including Data Flow Diagrams, E-R notation and structured design tools. There is a focus on software testing, from unit testing to the testing of software releases. Case studies provide practical examples for many of these concepts.

B. **Course Outcomes:** At the end of the course, students will be able to:

[1501.1]. To understand the system concept and need of software systems.

[1501.2]. To improve the software process; assist in planning, tracking and control of software project; and asses the quality of product that is produced

[1501.3]. To integrate process, methods and tools for the development of computer software

[1501.4]. To follow the design principles and concepts as the design process proceed

[1502.5]. To conduct strategic test plans to meet test objectives: to find and remove errors in an orderly and effective manner.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**
[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology
[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings
[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them
[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.
[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

D. **[**PSO1] Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.
[PSO2] Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[PSO3] Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction to System Concepts: Definition, Elements of System, Characteristics of System, Types of System, System Concepts. **Introduction to Software Engineering:** Definition, Need for software engineering, Software Characteristics, Software Qualities (McCall's Quality Factors) **Requirement Analysis:** Definition of System Analysis, Requirement Anticipation, Knowledge and Qualities of System Analyst, Role of a System Analyst, Feasibility Study And It's Types, User Transaction Requirement, User design Requirements, SRS(System Requirement Specification) **Software Development Methodologies:** SDLC (System Development Life Cycle), Waterfall Model, Spiral Model, Prototyping Model. **Analysis and Design Tools:** Entity-Relationship Diagrams, Data Flow Diagrams (DFD), Data Dictionary & Elements of Data Dictionary, Pseudo code, Input And Output Design. **Structured System Design:** Modules Concepts and Types of Modules, Structured Chart, Qualities of Good Design, Coupling, Types of Coupling, Cohesion, Types of Cohesion. **Software Testing:** Definition, Test characteristics, Types of testing - Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing

F. TEXT BOOKS

- Roger S. Pressman, *"Software Engineering"*, Tata McGraw Hills, 5th Edition, 2009.
- Ian Sommerville, *"Software Engineering"*, Pearson Education Asia, 6th Edition, 2005.

G. REFERENCE BOOKS

- Pankaj Jalote, *"An Integrated Approach to Software Engineering"*, Springer Publications, 2010.

H. Lecture Plan:

Lectures	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1-2	**Introduction to System Concepts**	Definition, Elements of System, Characteristics of System, System	Understanding Cos, Pos and PSOs	Lecture	CA 1501 .1	Mid Term I, Assignment/Quiz

3-4		Types of System	Defining System and types	Practice	CA 1501 .1	Mid Term I, Assignment/Quiz
5-6.	**Introduction to Software Engineering**	Definition, Need for software Engineering, Software Characteristics,	Recognizing need of Software Engineering	Lecture	CA 1501 .2	Mid Term I, Assignment/Quiz
7-8.		Software Qualities (McCall's Quality Factors)	Identifying quality attributes	Lecture	CA 1501 .2	Mid Term I, Assignment/Quiz
9-11		Definition of System Analysis, Requirement Anticipation, Knowledge and Qualities of System	Understanding Requirements and analysis	Lecture	CA 1501 .2	Mid Term I, Assignment/Quiz
12-14		Feasibility Study And It's Types	Comprehend feasibility	Lecture	CA 1501 .2	Mid Term I, Assignment/Quiz
15		User Transaction Requirement, User design Requirements	Introducing requirements	Lecture	CA 1501 .2	Mid Term I, Assignment/Quiz
16-17		SRS(System Requirement Specification)	Creating SRS	Activity	CA 1501 .2	Mid Term I, Assignment/Quiz
18	**Software Development Methodologies**	SDLC (System Development Life Cycle)	Defining SDLC	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
19		Waterfall Model	Understanding Waterfall model	Lecture and Activity	CA 1501 .3	Mid Term II, Assignment/Quiz
20		Prototyping Model	Identify with prototyping	Lecture and Activity	CA 1501 .3	Mid Term II, Assignment/Quiz
21		Spiral Model	Recognize Spiral model need	Lecture and Activity	CA 1501 .3	Mid Term II, Assignment/Quiz
22-24	**Analysis and Design Tools**,	Entity-Relationship Diagrams,	Creating ER model	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz

25-27		Data Flow Diagrams (DFD)	Creating DFD	Lecture	CA 1501 .3	Mid Term I, Assignment/Quiz
28		Data Dictionary & Elements of Data Dictionary, Pseudo code	Understanding data dictionary	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
29-30		Input And Output Design	Understanding I/O designs	Activity	CA 1501 .3	Mid Term II, Assignment/Quiz
31-32	**Structured System Design**	Modules Concepts and Types of Modules	Applying module concepts	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
33		Structured Chart	Implementing SC	Lecture	CA 1501 .3	Mid Term II, Assignment/Quiz
34		Qualities of Good Design	Understanding quality design	Lecture	CA 1501 .3	Assignment/Quiz & End Term
35-38.		Coupling, Types of Coupling, Cohesion, Types of Cohesion	Identifying cohesion and coupling	Practice	CA 1501 .3	Assignment/Quiz & End Term
39.	**Software Testing**	Definition, Test characteristics	Understanding testing	Lecture	CA 1501 .4	Assignment/Quiz & End Term
40-41		Types of testing - Black-Box Testing, White-Box Testing, Stress Testing, Performance Testing	Identify types of testing	Lecture	CA 1501 .4	Assignment/Quiz & End Term
42-43.		Black-Box Testing	Understanding black	Activity	CA 1501 .4	Assignment/Quiz & End Term
44-45.		White-Box Testing	Understanding white box testing	Activity	CA 1501 .4	Assignment/Quiz & End Term
46-47		Stress Testing	Understanding stress testing	Activity	CA 1501 .4	Assignment/Quiz & End Term
48-50		Performance Testing	Understanding performace testing	Activity	CA 1501 .4	Assignment/Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1501.1	To understand the system concept and need of software systems.	1	1	1	2	1	3	1	1	3	1
CA 1501.2	To integrate process, methods and tools for the development of computer software	1		1	3	1	2	1	1	3	1
CA 1501.3	To improve the software process; assist in planning, tracking and control of software project; and asses the quality of product that is produced	2		3	3	1	1		2	1	2
CA 1501.4	To follow the design principles and concepts as the design process proceed	2	1		3	1			2	1	1
CA 1501.5	To conduct strategic test plans to meet test objectives: to find and remove errors in an orderly and effective manner	2	2	3	2	1	2	2	1		2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications
Course Hand-out

Computer Graphics| CA 1502 | 4 Credits | 3 1 0 4

Session: Aug– Dec | Faculty: Mrs. Kuntal Gaur | Class: BCA V SEMESTER

A.   **Introduction:** This course is offered by Department of Computer Application as a compulsory subject, targeting the students of BCA who wish to pursue job in Industries or higher studies in the field of computer Graphics. After learning through this course, students will be able to understand how a visual device displays components over display unit such as monitor, TV etc. Students are expected to have background knowledge of Coordinate Geometry, Programming concepts, and visual devices.

B.   **Course Outcomes:** At the end of the course, students will be able to:

[1502.1]. Describe how a visual device displays, component work over display unit such as monitor, TV etc.

[1502.2]. Analysis the underline algorithm of graphics primitives, mathematical concepts, supporting computer graphics, These include but are not limited to: composite homogenous matrices for translation, rotation, and scaling transformation.

[1502.3]. Design and implement among models and viewing transformation

[1502.4]. Recognize and implement among model for light shading: color, ambient light, distant light with source; phomg reflection model; and shading (Flat, smooth, Gourand, Phong)

[1502.5]. Analyse future trends in computer graphics and also able to design 3D graphics system and to visualize them.

C.   **Program Outcomes:**

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

[PSO1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

[PSO2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems

[PSO3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.	

E. SYLLABUS

Basics of Computer Graphics: Introduction, What is computer Graphics? Area of Computer Graphics, Design and Drawing, Simulation, How are picture actually stored and displayed, difficulties for displaying pictures: Graphics Devices: Cathode Ray Tube, CRTs for Color Display, Beam Penetration CRT, The shadow, Mask CRT, Direct View Storage Tube, Tablets, The Light Pen, Three Dimensional Devices,: C Graphics Basics: Graphics Programming, initializing the graphics, C Graphical functions, simple programs:; Simple Line Drawing Methods: Point Plotting Technique, Qualities of good line drawing algorithms, The Digital Differential Analyzer (DDA), Brenham's Algorithm, Generation of Circles:

Two Dimensional Transformation: what is Transformation?, Matrix representation of Points, Basic transformation, Need for Clipping and Windowing, Line Clipping Algorithms, The midpoint subdivision Method, Other Clipping Methods, Sutherland-Hodgeman Algorithm, viewing. Transformation; Curves and Surfaces: shape description requirement, parametric functions, Bezier curve, Bezier surfaces, B-Spline methods: Solid Area Conversion: Solid Area scan Conversion, Scan Conversion of polygon, Algorithm Singularity,

Three-Dimensional Transformation: translation, Scaling, Rotation, Viewing Transformation, The Perspective algorithm, Three Dimension Clipping, Perspective view of Tube.

F. TEXT BOOKS

1. "Computer Graphics C Version/OpenGL version", Donald Hearn and M. Pauline baker, Pearson Education.
2. "Computer Graphics Principles and Practice", second edition in C, Foley, VenDam, Feiner and Hughes, Pearson Education.

G. REFERENCE BOOKS
1. "Computer Graphics second Edition" Zhigandxiang, RoyPlaystock, Schaum'Soutlines, TataMc Graw Hill Edition.

H. Lecture Plan:

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
1.	Overview of Computer Graphics	Introduction, what is Computer Graphics	Understand PO,CO,PSO	Lecture	1502.1	Mid Term I, Quiz & End Term
2.		Area of Computer Graphics, Design and Drawing, Simulation.	Visual Display System	Lecture	1502.1	Mid Term I, Quiz & End Term
3.	Display Devices & Display Techniques	How are pictures actually stored and displayed	Visual Display System	Lecture	1502.1	Mid Term I, Quiz & End Term
4.		Difficulties for Display picture	Visual Display System	Lecture	1502.1,	Mid Term I, Quiz & End Term

5.		Introduction of Input and Output	Component Work	Lecture	1502.1	Mid Term I, Quiz & End Term
6.		Cathode Ray Tube	Display Units	Lecture	1502.1	Mid Term I, Quiz & End Term
7.		Random Scan and Raster Scan	Display Units	Lecture	1502.1	Mid Term I, Quiz & End Term
8.		CRTs for Color Display	Display Units fu	Flipped Classroom	1502.1	Mid Term I, Quiz & End Term
9.		Beam Penetration CRT, The shadow mask method CRT	Display units	Activity	1502.1,	
10.		Direct View Storage Tube, The light Pen	Display Unit	Lecture	1502.1	Mid Term I, Quiz & End Term
11.		Tablets	Display Devices	Lecture	1502.1	Mid Term I, Quiz & End Term
12.		Three Dimensional Devices	Display Devices	Lecture	1502.1	Mid Term I, Quiz & End Term
13.		Input Devices	Display Devices	Lecture	1502.1	Mid Term I, Quiz & End Term
14.		Tutorial	Graphics Primitives	Tutorial	1502.2	Mid Term I, Quiz & End Term
15.		Graphics Programming, initializing the graphics	Mathematical Concepts	Lecture	1502.2	Mid Term I, Quiz & End Term
16.		C Graphical function	Mathematical Concepts	Lecture	1502.2	Mid Term I, Quiz & End Term
17.	C Implementation With Line Drawing	Simple programs	Mathematical Concepts	Flipped Classroom	1502.2	Mid Term I, Quiz & End Term
18.		Tutorial	Mathematical Concepts	Tutorial	1502.2	
19.		Simple Line Drawing methods, Point Plotting techniques	Algorithm	Lecture	1502.2	Mid Term I, Quiz & End Term
20.		Qualities of good Line drawing algorithms	Algorithm	Lecture	1502.2	Mid Term I, Quiz & End Term
21.		The Digital Differential Analyser (DDA)	Algorithm	Lecture	1502.2	Mid Term I, Quiz & End Term
22.		Brenham's Algorithm	Algorithm	Lecture	1502.2	Mid Term II, Quiz & End Term
23.		Generation of Circle	Algorithm	Lecture	1502.2	Mid Term II, Quiz & End Term
24.		Generation of Ellipse	Algorithm	Lecture	1502.2	Mid Term II, Quiz & End Term
25.		Polygon fill Algorithm	Algorithm	Lecture	1502.2	Mid Term II, Quiz & End Term
26.	Spherical Shapes	Tutorial	Homogenous matrices	Tutorial	1502.2	Mid Term II, Quiz & End Term
27.		Tutorial	Homogenous matrices	Tutorial	1502. 2	Mid Term II, Quiz & End Term
28.		What is Transformation	Transformation	Activity	1502.2	
29.		Matrix representation of points	Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term

30.	**Basic of Transformations**	Basic Transformation	Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
31.		Basic Transformation	Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
32.		Homogenous Matrix Reoperation	Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
33.		Homogenous Matrix Reoperation	Implementation Model	Flipped Classroom	1502.3	Mid Term II, Quiz & End Term
34.	**Types of Transformations and Viewing**	Reflection, Shearing	Scaling Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
35.		Tutorial	Scaling Transformation	Tutorial	1502.3	Mid Term II, Quiz & End Term
36.		Need of Clipping and Window	Viewing Transformation	Activity	1502.3	Mid Term II, Quiz & End Term
37.		Line Clipping Algorithm	Viewing Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
38.		The midpoint subdivision Methods	Viewing Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
39.		Other Clipping Methods	Viewing Transformation	Lecture	1502.3	Mid Term II, Quiz & End Term
40.		Sutherland Algorithm	Viewing Transformation	Tutorial	1502.3	Mid Term II, Quiz & End Term
41.	**Area Conversion**	Solid Area Conversion, Scan Area conversion	Clipping	Lecture	1502.3	Mid Term II, Quiz & End Term
42.		Tutorial	Clipping	Tutorial	1502.3	Quiz & End Term
43.		Tutorial	Clipping	Lecture	1502.3	Quiz & End Term
44.		Introduction to 3 Dimensional Object	3-Dimensional Object	Tutorial	1502.5	Quiz & End Term
45.		3-D Transformation	3 Dimensional Object	Activity	1502.5	
46.	**3-D Transformations**	Scaling and Rotation	3 Dimensional Object	Lecture	1502.5	Quiz & End Term
47.		Viewing Transformation	3 Dimensional Object	Lecture	1502.5	Quiz & End Term
48.		The perspective algorithm, Algorithm	3 Dimensional Object	Lecture	1502.5	Quiz & End Term
49.		Three Dimensional Clipping	3 Dimensional Object	Lecture	1502.5	Quiz & End Term
50.		Perspective view of Cube	3 Dimensional Object	Lecture	1502.5	Quiz & End Term
51.		Tutorial	3 Dimensional Object	Tutorial	1502.5	Quiz & End Term
52.		Tutorial	3 Dimensional Object	Tutorial	1502.5	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CA 1502.1	Describe How a visual device displays, component work over display unit such as monitor, TV etc	1				1	1										
CA 1502.2	Analysis the underline algorithm of graphics primitives, mathematical concepts, supporting computer graphics, These include but are not limited to: composite homogenous matrices for translation, rotation, and scaling transformation.	3														2	
CA 1502.3	Design and implement among models and viewing transformation		1	2												2	
CA 1502.4	Recognize and implement among model for light shading: color, ambient light, distant light with source; phomg reflection model; and shading (Flat, smooth, Gourand, Phong)			2	2												
CA 1502.5	Analyse future trends in computer graphics and also able to design 3D graphics system and to visualize them	1		1											1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application
Course Hand-out

Java Programming | CA 1503| 3 Credits | 3 1 0 4

Session: July 20 – Dec 20 | Faculty: Linesh Raja | Class: BCA (V Sem)

A. Introduction: Object oriented techniques have revolutionized the software development process and are used tremendously in IT industry to develop software products of various kinds. The course is designed to give students an in-depth understanding of the basic concepts of object-oriented programming such as encapsulation, inheritance and polymorphism using Java programming language. The course curriculum and structure has been divided into eight basic modules which covers the programming aspects related with object oriented domain such as exception handling, multithreading, GUI programming, event handling etc. The course will be taught with the help of several teaching aides such as power point presentation and via live debugging and execution demonstrations of several programming problems using Eclipse tool.

The main objective of the course is as follows:

- To teach students about the basics of classes and objects using Java programming language
- To enable the students to properly use the basic object oriented pillars such as encapsulation, inheritance and polymorphism.
- To enable the students to understand the basic difference between a class and an interface.
- To teach students about the implementation aspect of various basic data structures such as Linked Lists and
- Arrays using object oriented techniques
- To teach students how to provide various types of inheritance and polymorphism using classes and interfaces
- To introduce students about the role of modern programming constructs such as exceptions in modern
- programming languages
- To teach students about the basic of Multithreading, GUI Programming and Event handling

B. Course Outcomes: At the end of the course, students will be able to

[1503.1]. Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface.

[1503.2]. Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.

[1503.3]. Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

[1503.4]. Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

[1503.5]. Understand, Learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains for improving employability.

[1503.6]. Visualize a real world problem in the form of various collaborating classes and objects or skill development.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

[PSO.1]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.

[PSO.2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[PSO.3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

THE HISTORY AND EVOLUTION OF JAVA: The Creation of Java, how java changed the internet, Java's Magic, Servlets, The java Buzzwords; An Overview of Java, arrays; **INTRODUCTION TO CLASSES**: Class fundamentals, declaring objects, Assigning Object reference variables, Introduction to methods, Constructors, this keyword, Garbage collection, finalize() method, Overloading, objects as parameters, argument passing, returning objects, recursion, access control, final, nested and inner classes, string class; **I/O BASICS**: Reading Console Input, Writing Console Output, Files, Applet fundamentals; **INHERITANCE**: basics, super, multilevel hierarchy, overriding, abstract classes, final with inheritance; **PACKAGES AND INTERFACES**: Exception Handling, Multithreaded programming; String Handling, Applet Class, Event Handling; Collections & Generics; **INTRODUCTION TO AWT & SWINGS**: Classes, component, Container, Panel, Window, frame, Canvas, working with frame, working with Graphics, using Swing Controls.

F. Text Books

T1. The Complete Reference (9th Edition), By Herbert Schildt, McGraw Hill Education, ISBN-10:0071808558, ISBN-13: 978-0071808552

G. Reference Books

R1. Core Java Volume I - Fundamentals (10th Edition), By Cay Horstmann, Prentice Hall, ISBN-10:0134177304, ISBN-13: 978-0134177304, Year (2006)

R2. Object Oriented Programming in Java: A Graphical Approach (Preliminary Edition), By KE Sanders and AV Dam, Pearson Education, ISBN-10:0321245741, ISBN-13:978-0321245748, Year (2015)

R3. Java Concepts (4th Edition), Bt Cay horstmann, Wiley India, ISBN-10:0471697044, ISBN-13:978-0471697046, Year (2005)

H. Lecture Plan:

Lec No	Major Topics	Topics	Session outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to Java	Introduction and Course Hand-out briefing	Course objective	Lecture	NA	NA
2		The Creation of Java	About Java	Lecture	1503.1	In Class Quiz (Not Accounted)
3		How java changed the internet	Java and Internet	Lecture	1503.1	In Class Quiz End Term
4		Java's Magic, The java Buzzwords	About Java	Guided Self-Study	1503.1	Home Assignment End Term
5		An Overview of Java	About Java	Lecture	1503.2	In Class Quiz End Term
6		Arrays	Array and their initialization	Activity	1503.2	Class Quiz Mid Term I End Term
7- 8	Class & Objects	Class fundamentals, Class fundamentals, Declaring objects	Class & Object	Lecture	1503.2	Class Quiz Mid Term I End term
9		Assigning Object reference variable	Object referencing	Lecture	1503.2	Home Assignment Class Quiz Mid Term I End Term
10		Introduction to methods	Member methods	Activity	1503.2	Class Quiz Mid Term I End Term
11		Constructors	Initialization and their use	Lecture	1503.2	Class Quiz Mid Term I End Term
12		this keyword	Various aspects of this keyword	Lecture	1503.2	Class Quiz End Term
13		Garbage collection	De-allocation of memory	Lecture	1503.4	Class Quiz Mid Term II End Term
14		finalize() method	Uses of method	Lecture	1503.4	Class Quiz Mid Term II End Term
15		Overloading	Concept of overloading	Lecture	1503.4	Class Quiz Mid Term II End Term
16-17		Objects as parameters, Argument passing, Returning objects	Object passing	Lecture	1503.4	Class Quiz Mid Term II End Term

18		Recursion	Use of recursion in class & object	Lecture	1503.4	Class Quiz End Term
19		Access control, Final	Use of various access and final keyword	Lecture	1503.4	Class Quiz End Term
20		Nested and inner classes	Uses and their applications	Lecture	1503.4	Class Quiz End Term
21		String class	Uses and their applications	Lecture	1503.4	Class Quiz End Term
22		Reading Console Input, Writing Console Output, Files	Uses and their applications	Lecture	1503.5	Class Quiz End Term
23-24		Applet fundamentals	Introduction	Lecture	1503.5	Class Quiz End term
25-26		Inheritance Basic, super, multilevel hierarchy	Uses and their applications	Lecture	1503.5	Class Quiz
27-28		Overriding, abstract classes, final with inheritance	Uses and their applications	Lecture	1503.5	Class Quiz Mid Term II End Term
29	Java Concepts and their applications	Exception Handling	Uses and their applications	Lecture	1503.3 1503.5	Class Quiz Mid Term II End Term
30-31		Multithreaded programming; String Handling, Applet Class, Event Handling	Uses and their applications	Lecture	1503.3 1503.5	Class Quiz Mid Term II End Term
32		Collections & Generics	Uses and their applications	Lecture	1503.3 1503.5	Class Quiz End Term
33-34		AWT & Swing classes, component, Container	Uses and their applications	Lecture	1503.4 1503.6	Class Quiz End Term
35-36		Panel, Window, frame, Canvas, working with frame	AWT based application development	Lecture	1503.6	Class Quiz End Term
37-38		Working with Graphics	Application development	Lecture	1503.6	Class Quiz End Term
39-41		Swing Controls	Application development	Lecture	1503.6	Class Quiz End Term
42		Revision	Discussion of course outcome	Lecture	NA	NA
LAB SESSIONS	Java & their applications	Lab sessions based on object oriented programming concepts. Applets, AWT and Swing based application development		Lab Sessions	1503.1 - 1503.6	Experimental results 14 lab sessions End Term Practical End Term Theory

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1503.1	Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface.	3						1			2
CA 1503.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.		2	2							2
CA 1503.3	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.				2	2			3		
CA 1503.4	Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.						2		3		
CA 1503.5	Understand, Learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains for improving employability.			1					3	2	
CA 1503.6	Visualize a real world problem in the form of various collaborating classes and objects or skill development.	3	2	2	2				3	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. Course Outcome Attainment Level Matrix

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%							ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1503.1	Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface.										
CA 1503.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.										
CA 1503.3	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.										
CA 1503.4	Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.										
CA 1503.5	Understand, Learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains for improving employability.										
CA 1503.6	Visualize a real world problem in the form of various collaborating classes and objects or skill development.										

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications
Course Hand-out

Introduction to Unix Programming | CA 1504 | 4 Credits | 3 1 0 4

Session: Jul 19 – Dec 19 | Faculty: Dr. Vaibhav Bhatnagar | Class: BCA V SEMESTER

A. **Introduction:** The objective of this course is to provide a comprehensive introduction to Unix operating system Shell programming. To understand the fundamental design of Unix operating system and its structure. To gain an understanding of important aspects related to the shell and the process. Be familiar with basic Unix concept such as process, program, groups and signals, running programs, process control, user and kernel modes, system calls.

B. **Course Outcomes:** At the end of the course, students will be able to:

[1504.1]. Describe the architecture and features of Unix operating system and distinguish it from other Operating Systems.

[1504.2]. Understand, Identify and use Unix commands and utilities to create and manage simple processing operations, organize directory structure with appropriate security and develop shell scripts to perform more complex tasks.

[1504.3]. Analyses a given problem and apply requisite facets of shell programming in order to devise a SHELL SCRIPT to solve problem

[1504.4]. Apply fundamental concepts of Unix programming to automate the jobs and Process in Unix Environment

C. **Program Outcomes:**

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

[PSO1]. Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

[PSO2]. Encourage to communicate effectively and to improve their competency skills to solve real time problems

[PSO3]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.	

E. SYLLABUS

Unix Operating System, Multiuser, multitasking, Kernel and Shell, System calls and System program, command usage, General purpose utilities, Introduction to Vi-editor, Unix file system, File types, File attributes, Inode, File descriptor, Navigating the file system, Handling ordinary files, Hard link and Symbolic links, System call for process control-fork, wait, exec, and exit, signals, orphan and Zombie, Shell Wild card, Escaping.

Quoting, Redirection, Pipe, command substitution, System calls for redirection and pipe, Shell programming: Shell variables, echo and read commands, Command line arguments, Arithmetic in Script-expr and bc, Exit Status, test command-Numeric test and String test, Taking Decisions-If-then-else and case, The loop control structure-while, for and repeat until.

F. TEXT BOOKS

1. Sumitabha Das, "Unix Conxepts and Appplications", TMH
2. Richard Stevens, "Advanced Programming in the Unix Environment", Pearson.

G. REFERENCE BOOKS
1. Maurice J. Bach ," Design of Unix Operating System", Prentice Hall..

H. Lecture Plan:

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
1.	Introduction to Unix	Introduction and course handout brief	Introduction of CO	Lecture	1504.1	Mid Term I, Quiz & End Term
2.		Unix Operating System-Overview and History	Unix Operating System	Lecture	1504.1	Mid Term I, Quiz & End Term
3.		Features of Unix	Architecture of Unix	Lecture	1504.1	Mid Term I, Quiz & End Term
4.		Tutorial	Architecture of Unix	Tutorial	1504.1,	Mid Term I, Quiz & End Term
5.		Structure of Unix System	Architecture of Unix	Lecture	1504.1	Mid Term I, Quiz & End Term
6.	Architecture of Unix and File concepts	Difference between Unix and Linux	Features of Unix	Lecture	1504.1	Mid Term I, Quiz & End Term
7.		Unix Environment, Introduction to Files	Features of Unix	Lecture	1504.1	Mid Term I, Quiz & End Term
8.		Tutorial	Features of Unix	Tutorial	1504.1	Mid Term I, Quiz & End Term
9.		File descriptor, File Attributes	File processing operating	Activity	1504.2	
10.		Types of File, Hard Links, Symbolic Link	File processing operating	Lecture	1504.2	Mid Term I, Quiz & End Term

11.		Revision and Briefing	File processing operating	Lecture	1504.2	Mid Term I, Quiz & End Term
12.		Tutorial	File processing operating	Tutorial	1504.2	Mid Term I, Quiz & End Term
13.		Basic Unix Command: Internal and External Commands	Unix Command	Lecture	1504.2	Mid Term I, Quiz & End Term
14.		Structure of Commands	Unix Command	Lecture	1504.2	Mid Term I, Quiz & End Term
15.		Basic Commands, understanding of Command Usage	Unix Command	Lecture	1504.2	Mid Term I, Quiz & End Term
16.		Tutorial	Unix Command	Tutorial	1504.2	Mid Term I, Quiz & End Term
17.	**Unix Basic Commands**	General Purpose Utilities	Utilities	Flipped Classroom	1504.2	Mid Term I, Quiz & End Term
18.		Advanced General Purpose Utilities	Utilities	Activity	1504.2	
19.		Directory and File base commands	File Handling	Lecture	1504.2	Mid Term I, Quiz & End Term
20.		Tutorial	File Handling	Tutorial	1504.2	Mid Term I, Quiz & End Term
21.		More file Handling Commands	File Handling	Lecture	1504.2	Mid Term I, Quiz & End Term
22.		File and Directory Permission	File Handling	Lecture	1504.2	Mid Term II, Quiz & End Term
23.		Changing File ownership, File access permission" unmask, chmod, group	File Handling	Tutorial	1504.2	Mid Term II, Quiz & End Term
24.	**Basic of Shell Script**	Tutorial	File Handling	Tutorial	1504.2	Mid Term II, Quiz & End Term
25.		Introduction to Vi Editor	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
26.		Introduction to shell programming: Types of Shell	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
27.		Revision and Briefing	Shell Programming	Lecture	1504. 2	Mid Term II, Quiz & End Term
28.		Tutorial	Shell Programming	Tutorial	1504.2	
29.	**Shell Script**	Unix Wild Card, Escaping, Quoting, Redirection, pipe, command substitution	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
30.		Command Substitution, Shell variable, script example	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
31.		Interactive Shell Script	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
32.		Tutorial	Shell Programming	Tutorial	1504.3	Mid Term II, Quiz & End Term
33.		Simple Shell Script	Shell Programming	Flipped Classroom	1504.3	Mid Term II, Quiz & End Term
34.	**Basic Shell Scripts**	Logical Operators, Control Structures	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
35.		Case Structurer	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
36.		Tutorial	Shell Programming	Tutorial	1504.3	Mid Term II, Quiz & End Term

37.		For Loop, Nesting of Loop	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
38.		While Loop, Do While	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
39.		Loop Nesting of While and Do While	Shell Programming	Lecture	1504.3	Mid Term II, Quiz & End Term
40.		Tutorial	Shell Programming	Tutorial	1504.3	Mid Term II, Quiz & End Term
41.		Repeat Until Loop, Exit Loop	Shell Script	Lecture	1504.3	Mid Term II, Quiz & End Term
42.		Process Concepts	Shell Script	Lecture	1504.3	Quiz & End Term
43.	**Advance Shell Script**	Revision and Briefing	Shell Script	Lecture	1504.3	Quiz & End Term
44.		Tutorial	Shell Script	Tutorial	1504.3	Quiz & End Term
45.		System Process, Orphan and Zombie Process	Shell Script	Activity	1504.3	
46.		Tutorial	Shell Script	Tutorial	1504.3	Quiz & End Term
47.		Process related System calls	System Call	Lecture	1504.4	Quiz & End Term
48.		System call for Redirection	System Call	Lecture	1504.4	Quiz & End Term
49.	**System cal;**	System call for Pipe	System Call	Lecture	1504.4	Quiz & End Term
50.		System call for Low level input	System Call	Lecture	1504.4	Quiz & End Term
51.		Signals, classes of Signals	System Call	Lecture	1504.4	Quiz & End Term
52.		Tutorial	System Call	Tutorial	1504.4	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CA 1504.1	Describe the architecture and features of Unix operating system and distinguish it from other Operating Systems.	1	2	2	0	0	0	1	0	0	0	0	0	2	0	1	0
CA 1504.2	Understand, Identify and use Unix commands and utilities to create and manage simple processing operations, organize directory structure with appropriate security and develop shell scripts to perform more complex tasks.	2	2	2	0	1	0	0	0	0	0	0	0	2	0	1	0
CA	Analyses a given	0	2	2	0	0	0	0	0	0	0	0	0	2	0	1	0

1504.3	problem and apply requisite facets of shell programming in order to devise a SHELL SCRIPT to solve problem															
CA 1504.4	Apply fundamental concepts of Unix programming to automate the jobs and Process in Unix Environment	2	0	2	0	0	0	0	0	0	0	0	0	2	0	1	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications

Course Hand-out

Non Linear Data Structures| CA 1505 | 4 Credits | 3 1 0 4

Session: August – December

Faculty: Mrs.Kuntal Gaur

Class: B.C.A

A. **Introduction:** The objective of this course is to make students acquainted with working and implementation of nonlinear data structures like trees and graphs. Second objective is to increase knowledge of student so that one can write efficient program using knowledge of data structure. The course will be taught with the help of GCC compiler.

The main objective of the course are as follows:

- Apply knowledge of data structures to solve problems.
- Describe how trees, graphs and heaps are represented in memory and used by algorithms.
- Choose appropriate data structures to solve problems and assess the trade-offs involved in the design choices.
- Programming using GCC compiler in Linux.

B. **Course Outcomes:** At the end of the course, students will be able to

[CA1505.1]. Elucidate basic concepts of Non- Linear Data Structure.

[CA1505.2]. Describe how trees, graphs, heap and other data structures are represented in memory and how

they can be implemented using Linked list and arrays in memory.

[CA1505.3]. Perform various operations on Non-Linear Data Structures for improving programming skills.

[CA1505.4]. Understand complexity notations and analyse complexity of various algorithms.

[CA1505.5]. Describe and analyse various searching and sorting algorithms.

[CA1505.6]. Analyse the problem statement and decide appropriate data structure to solve the problem efficiently

for enhancing employability.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

PROGRAM OUTCOMES

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2]. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9]. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Clarity on both conceptual and application-oriented skills of IT Applications in Business context.

[PSO.2]. To develop and manage policies related to organizations' IT systems.

[PSO.3]. In-depth knowledge &sustained learning leading to innovation& research to fulfil global interest.

D.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E.   SYLLABUS

NONLINEAR DATA STRUCTURE: Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, insertion and deletion, Binary search trees, Applications Of Trees- Some balanced tree mechanism, eg. AVL trees, 2-3 trees, Height Balanced, Weight Balance , B Tree, B+ Tree, Graph-Matrix Representation Of Graphs, Elementary Graph operations,(Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree).**ALGORITHMS**: Algorithm Definition, Complexity of Algorithms: Time & space complexity, Bestcase, worst-case, average-case, Asymptotic notations, Searching Algorithm: Linear or sequential search, Binary search, Interpolation search using array, Complexity of Linear search, Binary search, Interpolation Search Sorting Algorithm: Bubble sort, Selection sort, Insertion sort, Merge sort Complexity of sorting algorithms.

F.   TEXT BOOKS

1. O.G. Kakde &U.A. Deshpandey, *"Data Structures and Algorithms"*, ISTE/EXCEL BOOKS,2003
2. Aho Alfred V., Hopperoft John E., UIlman Jeffrey D., *"Data Structures and Algorithms"*, Addison Wesley , 2002
3. Drozdek, "Data Structures and Algorithms", Vikas Publications,2003

G.   REFERENCE BOOKS:

1. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, *"Introduction to Algorithms"*,2002
2. Heileman, *"Data Structure Algorithims & OOP"*, Tata McGraw Hill., 2003
3. M.Radhakrishnan and V.Srinivasan, *"Data Structures Using C"* ISTE/EXCEL BOOKS,1983
4. Horowitz Ellis & Sartaj Sahni, *"Fundamentals of Data Structures"*, Galgotria Publication, 2004.
5. Tanenbaum A. S., *"Data Structures using C"* Pearson Publication, 2004.
6. Ajay Agarwal *"Data structure Through C"*, Cybertech Publication, 2005.Balaguruswamy, "Computing Fundamentals & C Programming", TataMcGraw Hill, 2008.

H.   Lecture Plan:

Lectures	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Introduction to Computers (1-2 Lecture)**	Introduction and Course Hand-out briefing	Understand CO, PO and PSO	Power Point Presentation	NA	
2.		Introduction to non-linear data structure	Learn about nonlinear data structure	Lecture	1505.1	Mid Term I, Quiz & End Term
3.		Introduction to algorithm and its complexity	Revise algo notation	Lecture	1505.1 &1505.4	Mid Term I, Quiz & End
4.	**Algorithms (1-2 Lecture)**	Trade off time and space complexity	Revisit complexity	Lecture	1505.1 &1505.4	Mid Term I, Quiz & End
5.		Asymptotic notations	Notations	Lecture	1505.1 &1505.4	Mid Term I, Quiz & End
6.		Tutorial	Tutorial	Activity	1505.1 &1505.4	Mid Term I, Quiz & End
7.		Basic terminologies, binary tree representation	Learn about trees	Lecture	1505.2	Mid Term I, Quiz & End
8.		In order and preorder tree traversal	Traversing tree	Lecture	1505.2	Mid Term I, Quiz & End Term
9.		Post order tree traversal	Traversing Tree	Lecture	1505.2	Mid Term I, Quiz & End Term
10.		Binary Search Tree and its implementation	Learn abut BST	Lecture	1505.2	Mid Term I, Quiz & End
11.		Threaded Binary tree	Threaded Binary tree	Lecture	1505.2	Mid Term I, Quiz & End
12.		Tutorial based on Binary tree	Tutorial	Tutorial	1505.2 &1505.3	Mid Term I, Quiz & End
13.		tutorial based on Binary Search Tree	Tutorial	Tutorial	1505.2 &1505.3	Mid Term I, Quiz & End
14.		Height balanced tree and AVL Tree	Learn AVL tree	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
15.		AVL Insertion	AVL insertion	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
16.	**Trees (8-12 Lecture)**	AVL deletion	AVL deletion	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
17.		Tutorial based on AVL tree	Tutorial	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
18.		Advantage of M-way tree over AVL tree,	M way trees	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
19.		M-way tree , B-tree Insertion & Deletion	M way trees	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
20.		B+ tree insertion & Deletion	B+ tree	Lecture	1505.2 &1505.3	Mid Term I, Quiz & End
21.		Tutorial based on B+ tree	Tutorial	Tutorial	1505.2 &1505.3	Mid Term I, Quiz & End
22.		Introduction to heap	Heap basics	Lecture	1505.2 &1505.3	Mid Term II, Quiz & End
23.		Min and Max Heap	Types of Heap	Lecture	1505.2 &1505.3	Mid Term II, Quiz & End
24.		Insertion and Deletion in a Heap	Heap Construction	Lecture	1505.2 &1505.3	Mid Term II, Quiz & End
25.		Heap sort	Sorting	Lecture	1505.2 &1505.3	Mid Term II, Quiz & End
26.		Tutorial based on Heap	Tutorial	Tutorial	1505.2 &1505.3	Mid Term II, Quiz & End
27.		Tutorial based on tree	Tutorial	Tutorial	1505.2 &1505.3	Mid Term II, Quiz & End
28.		Terminology and definition of graph, Graph	Learn about Graphs	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End
29.	**Graphs (13-19 Lecture)**	Linked list and array representation of graph	Memory Representation	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End Term
30.		Breadth first traversal	Graph Traversal	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End

31.		depth first and level order traversal	Graph Traversal	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End
32.		Tutorial based on Graph and Tree	Tutorial	Flipped Class	1505.2 &1505.6	Mid Term II, Quiz & End
33.		Spanning trees, minimum cost spanning tree	Spanning tree	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End
34.		Shortest path	MST	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End
35.		Prim's algorithm	MST algorithm	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End
36.		Kruskal's algorithm	MST algorithm	Lecture	1505.2 &1505.6	Mid Term II, Quiz & End
37.		Tutorial based on Spanning trees	Tutorial	Flipped Class	1505.2 &1505.6	Mid Term II, Quiz & End
38.		Examples based on Prim's algorithm	Tutorial	Activity	1505.2 &1505.6	Mid Term II, Quiz & End
39.		Examples based on Kruskal's algorithm	Tutorial	Activity	1505.2 &1505.6	Mid Term II, Quiz & End
40.		Tutorial	Tutorial	Activity	1505.2 &1505.6	Mid Term II, Quiz & End
41.		Linear search and Binary search	Searching	Lecture	1505.5	Quiz & End Term
42.		Interpolation of search using array	Interpolation	Lecture	1505.5	Quiz & End Term
43.		Tutorial based on searching	Tutorial	Lecture	1505.5	Quiz & End Term
44.		Insertion Sort, Selection	Sorting	Lecture	1505.5	Quiz & End Term
45.	**Searching and Sorting (20-29 lecture)**	Bubble sort	Sorting	Lecture	1505.5	Quiz & End Term
46.		Quick Sort	Sorting	Lecture	1505.5	Quiz & End Term
47.		Merge sort	Sorting	Lecture	1505.5	Quiz & End Term
48.		Radix sort	Sorting	Lecture	1505.5	Quiz & End Term
49.		Hashing, its advantage	Learn about Hash	Lecture	1505.5	Quiz & End Term
50.		Collision resolution	Collision resolution	Lecture	1505.5	Quiz & End Term
51.		Tutorial based on hashing.	Tutorial	Flipped Class	1505.5	Quiz & End Term
52.		Tutorial based on sorting	Tutorial	Activity	1505.5	Quiz & End Term
53.		Tutorial	Tutorial	Activity	1505.5	Quiz & End Term

I.Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CA 1505.1	Elucidate basic concepts of Non-Linear Data Structure	1	2	2	2	-	-	-	-	1	1	1	1	2	-	-
CA 1505.2	Describe how trees, graphs, heap and other data structures are represented in memory and how they can be implemented using Linked list and arrays in memory.	2	2	2	2	-	-	-	-	1	-	-	1	2	-	-
CA 1505.3	Perform various operations on Non-Linear Data Structures for improving programming skills.	3	2	2	1	-	-	-	-	1	-	-	1	3	-	-
CA 1505.4	Understand complexity notations and analyse complexity of various algorithms.	3	2	2	1	-	-	-	-	1	-	-	1	2	-	-
CA 1505.5	Describe and analyse various searching and sorting algorithms.	3	2	2	2	-	-	-	-	1	-	-	1	2	-	-
CA1505.6	Analyse the problem statement and decide appropriate data structure to solve the problem efficiently for enhancing employability.	1	2	1	1	-	-	-	-	1	-	-	2	2	-	-

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

School of Basic Sciences

Department of Computer Applications

Course Hand-out

Operating Systems| CA 1601 | 4 Credits | 3 1 0 4

Session: Jan – May -2021 | Faculty: Dr Pradeep Kumar Tiwari | Class: B.C.A VI

A. Introduction: This course provides a comprehensive introduction to understand the underlying principles, techniques and approaches which constitute a coherent body of knowledge in operating systems. In particular, the course will consider inherent functionality and processing of program execution. The emphasis of the course will be placed on understanding how the various elements that underlie operating system interact and provides services for execution of application software.

B. Course Outcomes: At the end of the course, students will be able to

[1601.1]. Understand and apply the concepts of Operating System.

[1601.2]. Illustrate various system calls to development sills for design functionality.

[16013]. In depth knowledge of process and threads and their scheduling.

[1601.4]. Better understanding of process synchronization and management

[1601.5]. Understand resource allocation process and deadlocks.

[1601.6]. Understanding of disk scheduling and various storage strategies.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web-designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Basic concepts, Simple Batch Systems, Multi-programmed Batched Systems, Time- Sharing Systems, Protection; **Processes and CPU scheduling:** Process Concept, Process scheduling, Operation on Processes, Cooperating Processes, Inter-process Communication. Scheduling Criteria, Scheduling algorithms; **Process Synchronization:** The Critical-Section problem, Synchronization Hardware, Basics of Semaphores; **Deadlocks:** Deadlock characterization, Methods of Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection & Recovery from Deadlock; **Memory Management:** Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging. Virtual Memory: Demand paging, Page replacement, Page-replacement algorithms.

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F. TEXT BOOKSE

Silberschatz and Galvin, "*Operating system concepts*", Addison- Wesley 1999

G. REFERENCE BOOKS

H.M. Diatel," An Introduction to Operating Systems", Addison- Wesley 1980.

Lecture Plan:

Lec No	Main Topic	Topics	Session Outcome	Mode of Delivery	Correspondi ng CO	Mode of Assessing the Outcome
1		Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2-5	**Introduction:**	Operating system structure, Operating system operations, Process management, Memory management Storage management, Protection and security, Special purpose systems.	Describe the objectives, functionality and different types of operating systems	Lecture	1601.1	Quiz MTE-1 End Term
6-9	**System structure:**	Operating system services, User operating system interfaces System calls, Types of system calls, System programs Operating system structure, Virtual machines, System boot.	Explain dual mode CPU operation, execution of system calls, interrupts, various operating system structures and booting process	Lecture	1601.1	Quiz MTE-1 End Term
10-15	**Process:**	Process Concept, Process scheduling Operations on processes Inter-process Communication, Unix Pipes	Describe process state transitions, process control block, and context switching and write system programs for process creation, execution, inter-process communication.	Lecture	1601.2	Quiz MTE-1 End Term Programming Assignment
16-20	**Multithreaded Programming:**	Overview, multithreaded models Thread libraries Programs using Pthreads	Describe significance of threads, multithreaded models and write system programs using PThreads	Lecture	1601.2	Quiz MTE-1 End Term Programming Assignment

21-26	**Process scheduling:**	Basic concepts, scheduling criteria, Scheduling Algorithms.	Compare various algorithms used for process scheduling based on various scheduling criteria	Lecture Tutorial	1601.3	Quiz Mid Term I End Term
26-32	**Process Synchronization:**	Background, Critical section problem Peterson's solution Synchronization Hardware, Semaphores Classical problems of synchronization. Programs using PThreads	Apply concepts related to concurrency to achieve the same for cooperating processes	Lecture Tutorial	1601.4	Quiz MTE-2 End Term Tutorial
33-37		Synchronization Programs using PThreads	Write programs for synchronization problems	Lecture	1601.4	Quiz MTE-2 End Term Project
37-40	**Deadlocks:**	System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	Apply various deadlock handling strategies to solve resource allocation problems	Lecture Tutorial	1601.4	Quiz MTE-2 End Term Tutorial
41-44	**Memory Management:**	Background, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation,	Evaluate the performance of different memory management techniques	Lecture Tutorial	1601.5	Quiz MTE-2 End Term Tutorial
45-48		Demand Paging, Page Replacement Policies, Allocation of Frames, Thrashing**.**	Describe the concept of virtual memory, and compare various page replacement algorithms	Lecture Tutorial	1601.5	Quiz End Term Tutorial

H. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA1601.1	Understand and apply the concepts of Operating System.	2	0	0	0	0	1	1	1	0	1
CA1601.2	Illustrate various system calls to design functionality.	0	1	0	0	2	0	0	0	1	0
CA1601.3	In depth knowledge of process and threads and their scheduling.	0	0	0	0	0	0	1	0	0	1
CA1601.4	Better understanding of process synchronization and management.	2	0	0	1	1	0	1	1	1	0
CA1601.5	Understand resource allocation process and deadlocks.	0	1	1	0	0	2	0	0	0	0
CA1601.6	Understanding of disk scheduling and various storage strategies.	0	0	0	1	0	0	0	0	0	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Application
Course Hand-out

Computer Networks | CA 1602 | 4 Credits | 3104

Session: Jan 2021 – June 21 | Faculty: Kuntal Gaur | Class: VI Semester

Introduction: The main objective of this course is to familiarize students with computer networks of today which are based on the TCP/IP model and its layered structure.

A.   **Course Outcomes:** At the end of the course, students will be able to

CA1602.1: Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.

CA1602.2: Analysis and Implement the Routing and its types.

CA1602.3 Demonstrate the Internet control protocols, IPV6 transitions.

CA1602.4: Analyse the Transport Layer and Its protocols, congestion control.

CA1602.5: Describe the Application Layer, its protocols and Network Security.

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

[PO.1].   Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2].   Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

[PO.3].   Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.4].   Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5].   Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6].   Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[**PO.7**]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

PROGRAM SPECIFIC OUTCOMES

[**PSO.1**]. Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects.

[**PSO.2**]. Encourage to communicate effectively and to improve their competency skills to solve real time problems.

[**PSO.3**]. Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

B.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

C.   SYLLABUS

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, MPLS. Classfull addressing, Sub-netting, Classless addressing, variable length blocks, address allocation; Protocols: ARP & DHCP: Introduction, Packet Format, message types, IPV4 header format, fragmentation, options, checksum. ICMP: Message format, message types. Dynamic routing protocols: RIP, OSPF & BGP, Multicasting Protocol;

Transport Layer: Transport services, state diagram, Elements of Transport Protocols: addressing, Connection establishment, connection release, Error control and Flow Control, Multiplexing, Congestion Control: Bandwidth allocation, regulating the sending rate, UDP: UDP header, TCP: TCP service model, TCP segment header, TCP connection establishment, TCP connection release, TCP window management, Timer management;

Application Layer: DNS: Name space, domain resource records, Electronic Mail: SMTP, POP, IMAP, MIME, HTTP, HTTPS, SNMP;
Network Security: Security Goals, Attacks, Attack prevention techniques, Firewall, IDS, DMZ, IPsec.

TEXT BOOKS:
1. A S Tanenbaum, Computer Networks, 5th Ed., Pearson, 2010.
2. B.A. Forouzan, TCP/IP Protocol Suite, 4th Ed., TMH, 2010.

REFERENCE BOOK:
1. W.R. Stevens, TCP/IP illustrated, Volume 1: The Protocols, 2nd Ed., Addison-Wesley, 2015.
2. D E. Comer, Internetworking with TCP/IP Principles, Protocols and Architecture, 6th Ed., Pearson, 2013.

D.   Lecture Plan:

lecture	Topics	Corresponding CO	Mode Of Assessing CO
1	Introduction to network Layer	1602.1	Mid Term I, Quiz & End Term
2	Network Layer Design Issues; Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service	1602.1	Mid Term I, Quiz & End Term
3	Network Layer Design Issues; Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service	1602.1	Mid Term I, Quiz & End Term
4	Routing Algorithms; Characteristics and Types, The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing,	1602.2	Mid Term I, Quiz & End Term
5	Routing Algorithms; Characteristics and Types, The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing,	1602.2	Mid Term I, Quiz & End Term
6	Routing Algorithms; Characteristics and Types, The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing,	1602.2	Mid Term I, Quiz & End Term
7	Routing Algorithms; Characteristics and Types, The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing,	1602.2	Mid Term I, Quiz & End Term
8	Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	1602.2	Mid Term I, Quiz & End Term

9	Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	1602.2	Mid Term I, Quiz & End Term
10	Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	1602.2	Mid Term I, Quiz & End Term
11	Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	1602.3	Mid Term I, Quiz & End Term
12	Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	1602.3	Mid Term I, Quiz & End Term
13	DHCP, ARP, RARP, ICMP, IPV4 and IPV6 header format	1602.3	Mid Term I, Quiz & End Term
14	DHCP, ARP, RARP, ICMP, IPV4 and IPV6 header format	1602.3	Mid Term I, Quiz & End Term
15	Fragmentation	1602.2	Mid Term I, Quiz & End Term
16	RIP, OSPF, BGP	1602.2	Mid Term I, Quiz & End Term
17	RIP, OSPF, BGP	1602.2	Mid Term I, Quiz & End Term
18	Congestion Control Algorithms; General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets	1602.1	Mid Term I, Quiz & End Term
19	Congestion Control Algorithms; General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets	1602.1	Mid Term I, Quiz & End Term
20	Congestion Control Algorithms; General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets	1602.1	Mid Term I, Quiz & End Term
21	Quality of Service; Requirements, Techniques for Achieving Good Quality of Service (till Packet Scheduling as per Tannenbaum)	1602.1	Mid Term I, Quiz & End Term
22	Quality of Service; Requirements, Techniques for Achieving Good Quality of Service (till Packet Scheduling as per Tanenbaum)	1602.1	Mid Term I, Quiz & End Term
23	Quality of Service; Requirements, Techniques for Achieving Good Quality of Service (till Packet Scheduling as per Tanenbaum)	1602.2	Mid Term I, Quiz & End Term
	First Sessional Examination		
24	Transport Layer; Introduction to Transport Layer, Transport Service Primitives	1602.4	Mid Term II, Quiz & End Term

25	Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	1602.4	Mid Term II, Quiz & End Term
26	Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	1602.4	Mid Term II, Quiz & End Term
27	Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	1602.4	Mid Term II, Quiz & End Term
28	Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	1602.4	Mid Term II, Quiz & End Term
29	UDP; UDP Header; Introduction to TCP	1602.4	Mid Term II, Quiz & End Term
30	The TCP Service Model, The TCP Protocol, The TCP Segment Header,	1602.4	Mid Term II, Quiz & End Term
31	The TCP Service Model, The TCP Protocol, The TCP Segment Header,	1602.4	Mid Term II, Quiz & End Term
32	TCP Connection Establishment, TCP Connection Release	1602.4	Mid Term II, Quiz & End Term
33	TCP Transmission Policy; Window Management, Connection Control, Timer Management	1602.4	Mid Term II, Quiz & End Term
34	TCP Transmission Policy; Window Management, Connection Control, Timer Management	1602.4	Mid Term II, Quiz & End Term
35	TCP Transmission Policy; Window Management, Connection Control, Timer Management	1602.4	Mid Term II, Quiz & End Term
36	Introduction to Application Layer; DNS—The Domain Name System	1602.5	Mid Term II, Quiz & End Term
37	Introduction to Application Layer; DNS—The Domain Name System	1602.5	Mid Term II, Quiz & End Term
38	Electronic Email; SMTP, POP, IMAP, MIME	1602.5	Mid Term II, Quiz & End Term
39	Electronic Email; SMTP, POP, IMAP, MIME	1602.5	Mid Term II, Quiz & End Term
40	HTTP, HTTPS	1602.5	Mid Term II, Quiz & End Term
41	HTTP, HTTPS	1602.5	Mid Term II, Quiz & End Term
42	SNMP		
	Second Sessional		
43	Network Security: Security Goals and Attacks	1602.5	Quiz & End Term
44	Firewall	1602.5	Quiz & End Term
45	IDS	1602.5	Quiz & End Term
46	IPsec	1602.5	Quiz & End Term
47	IPsec	1602.5	Quiz & End Term

E.   Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	Statement	Correlation with Program Outcomes												Correlation with Program Specific Outcomes			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CA1602.1	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.	2		3		3								3	1	2	
CA1602.2	Implement the Routing and its types			2										1	1	3	
CA1602.3	Demonstrate the Internet control protocols, IPV6 transitions.					1								1	1		
CA1602.4	Analyse the Transport Layer and Its protocols, congestion control.					1								1	1		1

CS1602

CO	Statement																
CA16 02.5	Describe the Application Layer, its protocols and Network Security.								2		2				1	1	1

1: Low Correlation   2: Moderate Correlation   3: Substantial Correlation

CO	Statement	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CA16 02.1	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.																
CA16 02.2	Implement the Routing and its types																
CA16 02.3	Demonstrate the Internet control protocols, IPV6 transitions.																
CA16 02.4	Analyse the Transport Layer and Its protocols, congestion control.																

CS1602

CA16 02.5	Describe the Application Layer, its protocols and Network Security.																		

1: Low Correlation   2: Moderate Correlation   3: Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application
Course Hand-out

DATA WAREHOUSING USING OLAP| CA 1603 | 4 Credits | 3 1 0 4

Session: Jan 20 – June 20 | Faculty: Linesh Raja | Class: BCA (VI Sem)

A. Introduction: We live in an age when technology is fast outpacing our thinking. We now think of newer tools and technologies to take care of our future needs. The data industry has come a long way since the earlier days of Data Warehousing. Today, data comes to us in various forms, and from multiple sources, unlike earlier days. The sources are not often disclosed, and the data needs to be sifted for meaningful information. The data engineer has taken the place of ETL developers, and DevOps has made its way into the data strategy. Data engineers work on platforms like Spark Architecture and Python. Algorithms have already forayed into Business Intelligence and decision making. Now, we can also extract data from multiple sources, before finding a pattern out of it.

This course gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for pre-processing of data. Modeling and design of data warehouses. Algorithms for classification, clustering and association rule analysis. Practical use of software for data analysis.

The main objective of the course is as follows:

- To teach students about the basics of Data Warehousing
- To enable the students to understand Data Warehousing types and architecture
- To enable the students to understand the basic differences and inter-relation between Data mining and Data Warehousing
- To teach students about the implementation Data Warehousing and Business Intelligence
- To teach students about Data Warehouse Appliances and future of Data Warehouse

B. Course Outcomes: At the end of the course, students will be able to

[1603.1]. Understand data ware housing and data mining.

[1603.2]. Learn and apply the concepts of data building and mapping.

[1603.3]. Describe and Implement data pre-processing and data quality.

[1603.4]. Learn and implement modeling and design of data warehouse.

[1603.5]. Understand, Learn and finally Implement the use of data warehouse cost-benefit analysis, data visualization.

[1603.6]. Visualize a real world problem in the form of various applications.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes.

[PSO.1]. To work productively as IT professional both at supportive and leadership roles.

[PSO.2]. To advance successfully in their chosen career path utilizing technical abilities, leadership qualities, communication and interpersonal skills with high regard to legal and ethical responsibilities.

[PSO.3]. To build their profession adaptable to the changes in the technology with lifelong learning.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	A student who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Data Warehousing Introduction: Data Warehouse, Data Warehouse Architecture, Implementation, Data Warehousing to Data Mining, Data warehousing components, building a data warehouse, mapping the data warehouse to an architecture, data extraction, cleanup transformation tools, metadata, Data Warehouse characteristics and definition; The purpose of Data Warehouse;

Data Marts: Data Warehouse Cost-Benefit Analysis / Return on Investment;

OLAP: Patterns and models – Data visualization principles, Data Mining functionalities, Major issues in Data Mining..

F. Text Books

T1. Han, M. Kamber, "Data Mining Concepts and Techniques", Elsevier, 2007.

T2. M. Berry, G. Linoff, "Data Mining Techniques", Wiley Publishing, 2004.

G. Reference Books

R1. Core Java Volume 1 - Fundamentals (10th Edition), By Cay Horstmann, Prentice Hall, ISBN-10:0134177304, ISBN-13: 978-0134177304, Year (2006)

R2. T. Davenport, "Competing on Analytics", Harvard Business Review (Decision Making), January 2006

R3 R. N Prasad, S. Acharya, "Fundamentals of Business Analytics", John Wiley & Sons, 2011

H. Lecture Plan:

Lec No	Major Topics	Topics	Session outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1		Introduction and Course Hand-out briefing	Course objective	Lecture	NA	NA
2		Data Warehouse	Introduction to DW	Lecture	1603.1	In Class Quiz (Not Accounted)
3-4		Data Warehouse Architecture	DW Architecture	Lecture	1603.1	In Class Quiz End Term
5-6		Implementation	DW Implementation	Guided Self-Study	1603.1	Home Assignment End Term
7-8		Data Warehousing to Data Mining	DW and DM	Lecture	1603.2	In Class Quiz End Term
9-10		Data warehousing components	DW Components	Activity	1603.2	Class Quiz Mid Term I End Term
11-12	Data Warehousing	Building a data warehouse	Basics of DW & M	Lecture	1603.2	Class Quiz Mid Term I End term
13-14		Mapping the data warehouse to an architecture	Basics of DW & M	Lecture	1603.2	Home Assignment Class Quiz Mid Term I End Term
15-16		Data extraction	Basics of DW & M	Activity	1603.2	Class Quiz Mid Term I End Term
17-18		Cleanup transformation tools	Basics of DW & M & implementation	Lecture	1603.2	Class Quiz Mid Term I End Term
19		Metadata	Basics of DW & M & implementation	Lecture	1603.2	Class Quiz End Term
20-21		Data Warehouse characteristics and definition	Basics of DW & M & implementation	Lecture	1603.3 1603.4	Class Quiz Mid Term II End Term
22-24		The purpose of Data Warehouse	Basics of DW & M & implementation	Lecture	1603.3 1603.4	Class Quiz Mid Term II End Term
25-27	Data Marts	Data Warehouse Cost-Benefit Analysis	DM and their Applications	Lecture	1603.3 1603.4	Class Quiz Mid Term II End Term
28-29		Data	DM and their Applications	Lecture	1603.4	Class Quiz

		Warehouse Return on Investment					Mid Term II End Term
30		Data Warehouse Cost-Benefit Analysis / Return on Investment	DM and their Applications	Lecture	1603.4		Class Quiz End Term
31-32		Patterns and models	DM Models				End Term
33-34		Data visualization principles	DM visualization	Lecture	1603.4 16035 1603.6		Class Quiz End Term
34-36	OLAP	Data Mining functionalities	DM Functions	Lecture	1603.4 16035 1603.6		Class Quiz End Term
37-38		Major issues in Data Mining	DM Issues	Lecture	1603.4 16035 1603.6		Class Quiz End Term
39-42		Revision	Course Outcome	Lecture			

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1603.1	Understand data ware housing and data mining.	3						1			2
CA 1603.2	Learn and apply the concepts of data building and mapping.		2	2							2
CA 1603.3	Describe and Implement data pre-processing and data quality.				2	2			3		
CA 1603.4	Learn and implement modeling and design of data warehouse.						2		3		
CA 1603.5	Understand, Learn and finally Implement the use of data warehouse cost-benefit analysis, data visualization.			1					3	2	
CA 1603.6	Visualize a real world problem in the form of various applications.	3	2	2	2				3	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications
Course Hand-out

Python Programming | CA1604 | 3 Credits | 3 1 0 4

Session: Jan '20 – May '20 | Faculty: Dr. Vanita Jaitly | Class: BCA VI Semester

Introduction: This course is offered by department of Computer Applications, targeting students who wish to pursue research & development in industries or higher studies, including Python programming, numpy, pandas, matplotlib, scipy libraries and gives an introductory level to advanced level knowledge on implementation of data structures as well as data analytics. Students are expected to have background knowledge on problem solving techniques and object oriented concepts for a better learning.

A. Course Objectives: At the end of the course, students will be able to

[1604.1]. Acquire basic programming skills of Python programming.

[1604.2]. Illustrate the concept of file handling and exception handling.

[1604.3]. Implement the concept of re-usability in python.

[1604.4]. Understand and Implement the concept of analytics using python libraries like numpy, Pandas, scipy.

[1604.5]. Enhance skills required for employability or entrepreneurship.

[1604.6]. Explain the concepts of Python Programming.

B. Program Outcomes and Program Specific Outcomes

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

Program Specific Outcomes for BCA program

PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	20
	Sessional Exam II (Open Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Open Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. Syllabus

Python Concepts: Introduction to Python, Variables, Keywords, Identifiers, Literals, Operators, Comments; **Control Statement:** if, if else, else if, nested if, for loop, while loop, break, continue, pass; **Data structures:** List, Tuple, Set, Dictionary; **Functions:** Functions overview, lambda function, Recursive functions, map, filter and reduce; File and Exception handling: Create a file, read and write operation with file, Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally. **Python OOPs:** OOPs Concepts, Object, Class, Constructors, Inheritance.

E. Text Books

T.1 W. McKinney, "*Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython*", Second Edition, O'Reilly, 2017.

T.2 A. Martelli, "*Python in a Nutshell*", Second Edition, O' Reilly, 2012.

T.3 J. Georzen, T. Bower, B. Rhodes, "*Foundations of Python Network Programming: The comprehensive guide to building network applications with Python*", Second Edition, Academic Press, 2010.

F. Reference Books

R.1 A. Geron, "*Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems*", First Edition, O'Reilly, 2017.

R.2 D. M. Beazley, *"Python Essential Reference"*, Second Edition, Amazon Books, 2010.

G. Lecture Plan:

Lec No	Major Topics	Topics	Mode of Delivery	Session Outcome	Corresponding CO	Mode of Assessing the Outcome
1-5	**Python Concepts**	Introduction to Python: Identifiers ,Variables, Keywords, Data types	Lecture	Able to	1604.1	Mid term I
			Lecture	know Identifiers	1604.1	In Class Quiz (Not Accounted)

		Literals, Operators, Comments	Lecture	,Variables, Keywords, Data types Literals, Operators, Comments	1604.1	In Class Quiz End Term
6-10	**Control Statement**	Control Statements: if, if else, else if, nested if, Reading and Writing on Console	Lecture	How to make Control Statements, read and display on screen	1604.1	Home Assignment End Term Mid Term I
11-14		Control Statements: for loop, while loop, break, continue, pass	Lecture	How iterators work	1604.1	In Class Quiz End Term Mid Term I
15-18	**Python Data Structures**	Strings	Lecture	Know about strings and their operations	1604.1	In Class Quiz Mid Term I End Term
19-22		List, Tuple	Lecture	Know about list, tuple and their operations	1604.3	Class Quiz Mid Term I End Term
23-25		Set, Dictionary(Mapping)	Lecture	Know about set, dictonary and their operations	1604.3	Class Quiz Mid Term I End term
26-29		Functions overview, lambda function, Recursive functions	Lecture	How to create functions and their usage	1604.1, 1604.3	Class Quiz End Term
30-32		Map, filter and reduce functions	Lecture	How to apply these functions	1604.1, 1604.3	Class Quiz Mid Term I End Term
33-36	**File Handling**	**File Handling:** Create a file, read and write operation with file	Lecture	Able to create a file and its operations	1604.4	Class Quiz Mid Term II End Term
37-40		**Exception Handling:** Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally	Lecture	Able to create exceptions and handle exceptions	1604.4	Class Quiz Mid Term II End Term
41-43	**Python OOPs**	OOPs Concepts	Lecture	Learn concepts of OOP	1604.2, 1604.5	Class Quiz End Term
44-45		Object, Class	Lecture	Learn concepts of OOP	1604.2, 1604.5	Class Quiz End Term
46		Constructors	Lecture	Learn concepts of OOP	1604.2, 1604.5	Class Quiz End Term
47		Inheritance	Lecture	Learn concepts of OOP	1604.2, 1604.5	Class Quiz End Term

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
							CORRELATION WITH PROGRAM OUTCOMES							CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
CA1604.1	Acquire basic programming skills of Python programming.	1	3	1										1			1
CA1604.2	Illustrate the concept of file handling and exception handling.		1	3													
CA1604.3	Implement the concept of re-usability in python.		1	2	1										1		
CA1604.4	Understand and Implement the concept of analytics using python libraries like numpy, Pandas, scipy.			1											1		
CA1604.5	Enhance skills required for employability or entrepreneurship.			3	2										2		
CA1604.6	Explain the concepts of Python Programming	2	2	2	2	1								2	3		2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Department of Computer Applications
Course Hand-out

Soft Computing | CA 1605 | 4 Credits | 3 1 0 4

Session: Jan 06-Apr 26, 2020| Faculty: Dr. Shilpa Kulkarni Sharma | Class: BCA VI SEMESTER

A. Introduction: This course aims at introducing the fundamental mathematical theory and concepts of computational intelligence methods, classification, probability, clustering, feature selection and their extraction together with the recent advances in PR.

B. Course Objectives: At the end of the course, students will be able to

1605.1	Learn about soft computing techniques and mathematical preliminaries.
1605.2	Analyze various classification techniques.
1605.3	Understand clustering methods and application.
1605.4	Define the feature selection and extraction algorithms
1605.5	Analyze the recent advances in PR related to soft computing and Neuro fuzzy

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

[PO.2]. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology

[PO.3]. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings

[PO.4]. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

[PO.5]. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them

[PO.6]. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

[PO.7]. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

[PSO1 Prepare professionally trained in the areas of programming, databases, software engineering, web- designing and networking and other completer application areas to acquire knowledge in various domain-based prospects

PSO2 Encourage to communicate effectively and to improve their competency skills to solve real time problems

PSO3 Understand to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	10
End Term Exam (Summative)	End Term Exam (Closed Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed.	

E. Syllabus:

Introduction and mathematical preliminaries: What is pattern recognition? Clustering vs. Classification; Applications; Linear Algebra, vector spaces, probability theory, estimation techniques. **Classification:** Bayes decision rule, Error probability, Error rate, Minimum distance classifier, Mahalanobis distance; K-NN Classifier, Linear discriminant functions and Non-linear decision boundaries. Fisher's LDA, Single and Multilayer perceptron, training set and test sets, standardization and normalization. **Clustering:** Different distance functions and similarity measures, Minimum within cluster distance criterion, K-means clustering, single linkage and complete linkage clustering, MST, medoids, DBSCAN, Visualization of datasets, existence of unique clusters or no clusters. **Feature selection:** Problem statement and Uses, Probabilistic separability based criterion functions, interclass distance based criterion functions, Branch and bound algorithm, sequential forward/backward selection algorithms, (l,r) algorithm. **Feature Extraction:** PCA, Kernel PCA. **Recent advances in PR:** Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy.
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F. Text Book(s):

1. S.N. Deepa, "*Principles Of Soft Computing, 2Nd Ed*", Wiley-India 2011

2. J.S.R. Jang, C. – T, Son, E.Mizutani "Neuro-fuzzy and Soft Computing" PEARSON ,2015
3. S.N. Sivanandam & S. N. Deepa "Principles of Soft Computing" , 2nd Edition, Wiley India, 2011.

G. Reference(s):
1. B. Kosko, "Neural Networks and Fuzzy Systems, A Dynamically Systems Approaches to machine intelligence", ACM, 1992.
2. S. Haykin, "Neural Networks-A Comprehensive Foundations", Prentice-Hall International, New Jersey, 1999.
3. 4. K. Knight, E. Rich, B. Nair, "Artificial Intelligence", 3rd Edition, McGraw Hill, 2008.

H. Lecture Plan:

Lecture	Major Topic	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction and mathematical preliminaries	What is pattern recognition?	To familiarize with soft computing concepts.	Lecture	1605.1	Class Quiz Mid Term I End Term
2.		Clustering vs. Classification;		Lecture	1605.1	
3.		Its applications		Lecture	1605.1	
4-7		Linear Algebra		Lecture	1605.1	
8-9		vector spaces		Lecture	1605.1	
10-13		probability theory		Lecture	1605.1	
14-16		estimation techniques		Lecture	1605.1	
17	Classification	Bayes decision rule	To learn Basics of classification techniques in soft computing.	Lecture	1605.2	
18-19		Error probability, Error rate, Minimum distance classifier,		Lecture	1605.2	
20-21		Mahalanobis distance; K-NN Classifier		Lecture	1605.2	
22-23		Linear discriminant functions and Non-linear decision boundaries		Lecture	1605.2	
24		Fisher's LDA		Handouts	1605.2	
25		Single and Multilayer perceptron,			1605.2	
26		training set and test sets,			1605.2	
27		Types of neural network:		Lecture	1605.2	
28		standardization and normalization		Lecture	1605.2	
29	Clustering	Different distance functions and similarity measures	Understand clustering methods and application	Lecture	1605.3	
30		Minimum within cluster distance criterion		Lecture	1605.3	
31		K-means clustering		Lecture	1605.3	
32		single linkage and complete linkage clustering		Lecture	1605.3	
33		MST, medoids		Lecture	1605.3	
34		DBSCAN		Lecture	1605.3	
35		Visualization of datasets		Lecture	1605.3	
36		existence of unique clusters or no clusters		Lecture	1605.3	

37		Problem statement and Uses		Lecture	1605.4	Class Quiz
38		Probabilistic separability based criterion functions		Lecture	1605.4	Mid Term II
39	**Feature selection**	interclass distance based criterion functions	Illustrate the feature selection algorithms	Lecture	1605.4	End Term
40		Branch and bound algorithm		Lecture	1605.4	
41		sequential forward/backward selection algorithms, (l,r) algorithm		Lecture	1605.4	
42-45	**Feature Extraction**	PCA, Kernel PCA	Identify extraction methods	Lecture	1605.4	
46-48	**Recent advances in PR**	Structural PR, SVMs, FCM, Soft-computing and Neuro-fuzzy	Introduce the recent advances in PR related to soft computing and Neuro fuzzy	Lecture	1605.5	

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES						CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PSO 3	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1605.1	Learn about soft computing techniques and mathematical preliminaries.	2			2	3			1		
CA 1605.2	Analyze various classification techniques.		2		3	2				1	1
CA 1605.3	Understand clustering methods and application.	2	3	2		1	1		1	1	
CA 1605.4	Define the feature selection and extraction algorithms				2		1			1	
CA 1605.5	Analyze the recent advances in PR related to soft computing and Neuro fuzzy	3		3			2	1	2	1	1

J.   Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES THRESHOLD VALUE: 40%						ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES			
		PO 1	PSO 3	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CA 1605.1	Learn about soft computing techniques and mathematical preliminaries.	2			2	3			1		
CA 1605.2	Analyze various classification techniques.		2		3	2				1	1
CA 1605.3	Understand clustering methods and application.	2	3	2		1	1		1	1	
CA 1605.4	Define the feature selection and extraction algorithms				2		1			1	
CA 1605.5	Analyze the recent advances in PR related to soft computing and Neuro fuzzy	3		3			2	1	2	1	1