



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

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# MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

## DEPARTMENT OF INFORMATION TECHNOLOGY PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Master of Computer Application | Academic Year: 2020-21

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### 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 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

- [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



# MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications

Course Hand-out

Discrete Mathematics | MA 6117 | 4 Credits | 3 | 0 4

Session: Aug 1 – November 30 | Faculty: Dr. Garima Agarwal | Class: MCA I 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

[6117.1]. To understand the concept of Set theory

[6117.2]. To understand the concept of Lattices

[6117.3]. To understand the concept of Boolean algebra

[6117.4]. To understand the concept of Group Theory

[6117.5]. To understand the concept of Logic

## 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**

PSO1: To work productively as IT professional both at supportive and leadership roles.

PSO2: 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.

PSO3: 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	20
End Term Exam (Summative)	End Term Exam (Open 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.	

### **A. SYLLABUS**

Set Theory: sets, subsets, set operation, Cartesian product, relation (properties, equivalence relation, and partition) and function (different types of functions and composite function). Principal of inclusion and exclusions (statement only and simple problems), Generating Functions recurrence relation. Order relation and Structures: Partially order, algebraic structures and POSET, Lattices, distributive, and complemented lattices, Boolean Lattice, Uniqueness of Boolean Lattices Boolean expression & function. Semi group & Group: Binary operation, semi- groups, product and quotients, groups products and quotients, Bernside theorem (statement only and simple problems) coding & decoding. Mathematical Logic: Statement and notations, connectives, normal forms, well-formed formulas, implication, Tautology, Predicate calculus.

#### **References:**

1. C.L. Lui, *Elements of Discrete Mathematics*, (4e) Houghton Mifflin, 2017
2. J.P.Tremblay & R. Manohar, *Discrete Mathematical Structure with Applications to Computer*

*Science*, (1e) McGraw Hill Education – 2017

### A. Lecture Plan:

S.No	Major Topic	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of assessing COs
1.	SET AND RELATION	Introduction and course handout briefing	Understand POS, PSO and COS	Lecture	NA	NA
2.		Set and set operations, Venn diagram	Introduce Set	Lecture	6117.1	Mid Term I, quiz and end term
3.		subsets	Understand subsets	Lecture	6117.1	Mid Term I, quiz and end term
4.		Cartesian product of set	Lean Set	Lecture	6117.1	Mid Term I, quiz and end term
5.		relation	Introduce relation	Lecture	6117.1	Mid Term I, quiz and end term
6.		Examples	Practice Questions	Lecture	6117.1	Mid Term I, quiz and end term
7.		type of relations	Understand relations	Lecture	6117.1	Mid Term I, quiz and end term
8.		equivalence relation	Understand relation	Lecture	6117.1	Mid Term I, quiz and end term
9.		properties of relation	Implementation of relation	Lecture	6117.1	Mid Term I, quiz and end term
10.		partition	Introduce partition	Lecture	6117.1	Mid Term I, quiz and end term

11.		Illustrative examples	Practice Questions	Lecture	6117.1	Mid Term I, quiz and end term
12.		Illustrative examples	Practice Questions	Lecture	6117.1	Mid Term I, quiz and end term
13.		Tutorial	Tutorial	Activity	6117.1	Mid Term I, quiz and end term
14.	FUNCTION	function	Introduce function	Lecture	6117.2	Mid Term I, quiz and end term
15.		Related examples	Practice Questions	Lecture	6117.2	Mid Term I, quiz and end term
16.		types of functions	Learn types of functions	Lecture	6117.2	Mid Term I, quiz and end term
17.		Related examples	Practice Questions	Lecture	6117.2	Mid Term I, quiz and end term
18.		composite function	implementation of composite function	Lecture	6117.2	Mid Term I, quiz and end term
19.		Related examples	Practice Questions	Lecture	6117.2	Mid Term I, quiz and end term
20.		Principal of inclusion and exclusions	implementation of Functions	Lecture	6117.2	Mid Term I, quiz and end term
21.		Related examples	Practice Questions	Lecture	6117.2	Mid Term I, quiz and end term
22.		Generating Functions	Learn Generating Functions	Lecture	6117.2	Mid Term I, quiz and end term
23.		recurrence relation	Understand recurrence relation	Lecture	6117.2	Mid Term I, quiz and end term
24.		Order relation	Introduce Order relation	Lecture	6117.2	Mid Term I, quiz and end term
25.		Related examples	Practice Questions	Lecture	6117.2	Mid Term I, quiz and end term
26.		Structures	Learn Structures	Lecture	6117.2	Mid Term I, quiz and end term
27.		Partially order functions	Learn Partially order functions	Lecture	6117.2	Mid Term I, quiz and end term
28.		Related examples	Practice Questions	Activity	6117.2	Mid Term I, quiz and end term
29.		algebraic structures	Introduce algebraic structures	Lecture	6117.2	Mid Term II quiz and end term
30.		Related examples	Practice Questions	Lecture	6117.2	Mid Term II quiz and end term

31.	POSET AND LATTICES	POSET	Introduce POSET	Lecture	6117.3	Mid Term II quiz and end term
32.		Related examples	Practice Questions	Lecture	6117.3	Mid Term II quiz and end term
33.		Lattices	Learn Lattices	Lecture	6117.3	Mid Term II quiz and end term
34.		Related examples	Practice Questions	Lecture	6117.3	Mid Term II quiz and end term
35.		distributive Lattices	Type of Lattices	Activity	6117.3	Mid Term I, quiz and end term
36.		Related examples	Practice Questions	Lecture	6117.3	quiz and end term
37.		complemented lattices,	Type of Lattices	Lecture	6117.3	quiz and end term
38.		Related examples	Practice Questions	Lecture	6117.3	quiz and end term
39.		Boolean Lattice	Understand Boolean Lattice	Lecture	6117.3	quiz and end term
40.		Related examples	Practice Questions	Lecture	6117.3	quiz and end term
41.		Boolean expression & function	Learn Boolean expression	Lecture	6117.3	quiz and end term
42.		Tutorial	Tutorial	Activity	6117.3	Mid Term I, quiz and end term
43.	Group Theory	Group	Introduce Group	Lecture	6117.4	
44.		Binary operation on group	Learn Group Theory	Lecture	6117.4	
45.		Related examples	Practice Questions	Lecture	6117.4	
46.		definition on semi-groups	Understanding semi- groups	Lecture	6117.4	
47.		groups products and quotients	Implementation of Group	Lecture	6117.4	
48.		Related examples	Practice Questions	Lecture	6117.4	
		Bernside theorem	Implementation of Group	Lecture	6117.4	
49.		Mathematical Logic	Introduce Logic	Lecture	6117.5	
50.		notations of Mathematical Logic	Implementation of Logic	Lecture	6117.5	
51.		normal forms of Mathematical Logic	Understanding Logic	Lecture	6117.5	

**B. Course Articulation Matrix: (Mapping of COs with POs)**  
**I- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA 6117.1	To understand the concept of Set theory	1													1	
MA 6117.2	To understand the concept of Lattices			1							1		1	1		
MA 6117.3	To understand the concept of Boolean algebra					1									1	
MA 6117.4	To understand the concept of Group Theory				1									1		
MA 6117.5	To understand the concept of Logic			1					1						1	

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





# MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications

Course Hand-out

Web Technologies| CA 6101 | 4 Credits | 3 | 0 4

Session: Jul 19 – Dec 19 | Faculty: Dr. Vaibhav Bhatnagar | Class: MCA I 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 Web Technologies. This is industry-oriented subject. After the completion of this course, students will be able to design a static as well as dynamic responsive website.

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

[6101.1]. Learn to design web pages with complete understanding of the process. Learn to use HTML tags to structure the content and Styling using CSS.

[6101.2]. Plan, design and develop web pages using responsive design. Understand issues with the help of case studies and solving those issues.

[6101.3]. Understand JavaScript syntax and design interactive website using JavaScript.

[6101.4]. Ability to analyse the requirements and create Interactive design using PHP with the use of Database technologies.

**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]. To work productively as IT professional both at supportive and leadership roles.

[PSO2]. 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.

[PSO3]. 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 (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: Concept of WWW, Internet and WWW, HTTP Protocol : Request and response, Web browser and Web servers, Features of Web 2.0, Web Design: Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation, JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons, XML : Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT, PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP, PHP and MySQL : Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs. Introduction to Angular JS4.

**F. TEXT BOOKS**

1. R. Moseley & M. T. Savaliya, Developing Web Applications, (2e) Wiley-India, 2013
2. Team at Kogent Learning Solutions Inc., Web Technologies, Black Book, (1e) Dreamtech Press, 2009

**G. REFERENCE BOOKS**

1. Team at Kogent Learning Solutions Inc., HTML 5, Black Book, (2e) Dreamtech Press, 2011
2. J. Sklar, Web Design Principles, (5e)Cengage Learning, 2012
3. Harwani, Developing Web Applications in PHP and AJAX, (1e) McGrawHill, 2010

**H. Lecture Plan:**

Lectur es	Major Topics	Topics	Session outcome	Delivery Mode	Correspond ing CO	Mode of Assessing CO
1.	Concept of Internet	Introduction of WWW	Introduction of Web Internet	Lecture	6101.1	Mid Term I, Quiz & End Term
2.		Concept of Internet	Introduction of Web Internet	Lecture	6101.1	Mid Term I, Quiz & End Term
3.	Basic Web Designing and JavaScript	HTTP Protocol	Introduction of Web Internet	Lecture	6101.1	Mid Term I, Quiz & End Term
4.		Web browser and Web Server	Introduction of Web Internet	Lecture	6101.1,	Mid Term I, Quiz & End Term
5.		Features of Web 2.0	Introduction of Web Internet	Lecture	6101.1	Mid Term I, Quiz & End Term

6.		Concept of Effective Web Designing	Plan and Design of Website	Lecture	6101.2	Mid Term I, Quiz & End Term
7.		Bandwidth, cache and Display Resolution	Plan and Design of Website	Lecture	6101.2	Mid Term I, Quiz & End Term
8.		Tutorial	Plan and Design of Website	Tutorial	6101.2	Mid Term I, Quiz & End Term
9.		Feel of interactive website , Page layout	Plan and Design of Website	Activity	6101.2	
10.		User centric design, Sitemap, Planning and Publishing of Website	Plan and Design of Website	Lecture	6101.2	Mid Term I, Quiz & End Term
11.		Introduction to JavaScript	JavaScript	Lecture	6101.3	Mid Term I, Quiz & End Term
12.		Condition, loop and repetition.	JavaScript	Lecture	6101.3	Mid Term I, Quiz & End Term
13.		Popup Boxes	JavaScript	Lecture	6101.3	Mid Term I, Quiz & End Term
14.		DOM of Java Script	JavaScript	Tutorial	6101.3	Mid Term I, Quiz & End Term
15.	<b>Advanced JavaScript and XML</b>	Tutorial	JavaScript	Tutorial	6101.3	Mid Term I, Quiz & End Term
16.		Validation in JavaScript	JavaScript	Lecture	6101.3	Mid Term I, Quiz & End Term
17.		Validation in JavaScript	JavaScript	Flipped Classroom	6101.3	Mid Term I, Quiz & End Term
18.		Tutorial	JavaScript	Tutorial	6101.3	
19.		Introduction to XML, use of XML	XML	Lecture	6101.2	Mid Term I, Quiz & End Term
20.		DTD and Schema	XML	Lecture	6101.3	Mid Term I, Quiz & End Term
21.		Transforming XML using XSL	XML	Lecture	6101.3	Mid Term I, Quiz & End Term
22.		Transforming XML using XSLT	XML	Lecture	6101.3	Mid Term II, Quiz & End Term
23.		Tutorial	XML	Tutorial	6101.4	Mid Term II, Quiz & End Term
24.	<b>Basic of PHP</b>	Introduction to PHP	PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
25.		Basic Syntax of PHP	Creating web Page PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
26.		Decision and Looping in PHP	Creating web Page PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
27.		Form processing in PHP	Creating web Page PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
28.		File Handling in PHP	Creating web Page PHP	Activity	6101.4	Mid Term II, Quiz & End Term
29.		Handling Session in PHP	Handling Web pages in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
30.		Cookies in PHP	Handling Web pages in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term

31.		Tutorial	Handling Web pages in PHP	Tutorial	6101.4	Mid Term II, Quiz & End Term
32.		Object oriented Programming in PHP	Handling Web pages in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
33.		In built Functions in PHP	Handling Web pages in PHP	Flipped Classroom	6101.4	Mid Term II, Quiz & End Term
34.	<b>Advanced PHP</b>	Introduction of Database	Handling Database in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
35.		Introduction of MySQL and PHPmyadmin	Handling Database in PHP	Tutorial	6101.4	Mid Term II, Quiz & End Term
36.		Basic commands of SQL	Handling Database in PHP	Activity	6101.4	Mid Term II, Quiz & End Term
37.		Tutorial	Handling Database in PHP	Tutorial	6101.4	Mid Term II, Quiz & End Term
38.		Connecting PHP through MYSQL	Handling Database in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
39.		Creating database in MYSQL through PHP	Handling Database in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
40.		Selecting Database in PHP	Handling Database in PHP	Tutorial	6101.4	Mid Term II, Quiz & End Term
41.	<b>Database handling in PHP</b>	Listing database and Creating a Table	Handling Database in PHP	Lecture	6101.4	Mid Term II, Quiz & End Term
42.		Tutorial	Handling Database in PHP	Tutorial	6101.4	Quiz & End Term
43.		Inserting rows in Database	Handling Database in PHP	Lecture	6101.4	Quiz & End Term
44.		Updating Rows in Database	Handling Database in PHP	Lecture	6101.4	Quiz & End Term
45.		Deleting Rows in Database	Handling Database in PHP	Lecture	6101.4	
46.	<b>Angular JS</b>	Tutorial	Handling Database in PHP	Tutorial	6101.4	Quiz & End Term
47.		Advance PHP myAdmin	PHP Myadmin	Lecture	6101.4	Quiz & End Term
48.		Database bug	PHP Myadmin	Lecture	6101.4	Quiz & End Term
49.		Introduction to Angular JS	Other technolgies	Lecture	6101.4	Quiz & End Term
50.		Implementation of Angular JS	Other technolgies	Lecture	6101.4	Quiz & End Term
51.		Tutorial	PHP	Tutorial	6101.4	Quiz & End Term
52.		Tutorial	PHP	Tutorial	6101.4	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 6101.1	Learn to design web pages with complete understanding of the process. Learn to use HTML tags to structure the content and Styling using CSS.					1		2						1			
CA 6101.2	Plan, design and develop web pages using responsive design. Understand issues with the help of case studies and solving those issues.	2		1				1						1	2	1	
CA 6101.3	Understand JavaScript syntax and design interactive website using JavaScript.	2						1						2		2	
CA 6101.4	Ability to analyse the requirements and create Interactive design using PHP with the use of Database technologies.	1						3						3		3	

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

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

[illegible]

	Interactive design using PHP with the use of Database technologies.															
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**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**

Master of Computer Application

Programming & Problem Solving using C | CA 6105 | 4 Credits | 3 1 0 4

Session: Jul - Nov 20 | Faculty: Dr. Timothy Malche | Class: MCA I SEMESTER

**Introduction:** The main objective of this course is to teach students the basics of programming fundamentals and enable them to build analytical & problem solving skills. The course covers concept of C programming from beginner to advance level and intended to make student expert in solving real world problems using C 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

**[CA6105.1].** Design Algorithms & Flow Chart, learn how to write good program, understand the rules/conventions of coding, documentation, variable naming.

**[CA6105.2].** Understand different datatypes and operators and how to use them.

**[CA6105.3].** Learn how to debug the programs for logical or syntactical errors.

**[CA6105.4].** Learn how to implement various control structures such as conditional and looping statements.

**[CA6105.5].** Write reusable programs using functions.

**[CA6105.6].** Understand how to access and manage computers memory for programs using pointers and dynamic memory management techniques.

**[CA6105.7].** Build analytical & problem solving skills and data structures.

**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

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**[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]** To work productively as IT professional both at supportive and leadership roles.

**[PSO2]** 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.

**[PSO3]** To build their profession adaptable to the changes in the technology with lifelong learning.

### 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

An overview: Algorithms & flowcharts; Characteristics of a good program. Rules/ conventions of coding, documentation, naming variables; Top down design; Bottom-up design. Fundamentals of C Programming: History of C; Structure of a C Program; Data types; Constant & Variable, naming variables; Operators & expressions; Control Constructs – if-else, for, while, do-while; Case switch statement; Arrays; Formatted & unformatted I/O; Type modifiers & storage classes; Ternary operator; Type conversion & type casting; Priority & associativity of operators. Modular Programming: Functions; Arguments; Return value; Parameter passing – call by value, call by reference; Return statement; Scope, visibility and life-time rules for various types of variable, static variable; Calling a function; Recursion – basics, comparison with iteration, types of recursion, when to avoid recursion, examples. Advanced Programming Techniques: Special constructs – Break, continue, exit(), goto & labels; Pointers - & and \* operators, pointer expression, pointer arithmetic, dynamic memory management functions like malloc(), calloc(), free(); String; Pointer v/s array; Pointer to pointer; Array of pointer & its limitation; Function returning pointers; Pointer to function, Function as parameter; Structure – basic, declaration, membership operator, pointer to structure. Introduction to Data Structures: Contiguous implementations of stack& queues, various operations on stack& queues.

## D. Textbooks

1. Kerninghan & Ritchie “The C programming language”, PHI

## E. Reference books

1. Schildt “C: The Complete reference” 4th ed TMH.
2. Cooper Mullish “The Spirit of C”, Jaico Publishing House, Delhi
3. Kanetkar Y. “Let us C”, BPB.
4. Tennenbaum A.M. & others: Data Structures using C & C++; PHI

## Lecture Plan:

LEC NO	Major Topic	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Accessing CO
1	Overview	Understanding CO	Overview of C Programming Course	Lecture	6105.1	Mid Term I, Quiz & End Term
2		Algorithm	Introduction to Algorithm & Flow Chart	Lecture	6105.1	Mid Term I, Quiz & End Term
3		Algorithm	Introduction to Algorithm & Flow Chart	Lecture	6105.1	Mid Term I, Quiz & End Term
4		Algorithm	Introduction to Algorithm & Flow Chart	Lecture	6105.1	Mid Term I, Quiz & End Term

5		Flowchart	Introduction to Algorithm & Flow Chart	Lecture	6105.1	Mid Term I, Quiz & End Term
6		Flowchart	Introduction to Algorithm & Flow Chart	Lecture	6105.1	Mid Term I, Quiz & End Term
7		Flowchart	Introduction to Algorithm & Flow Chart	Lecture	6105.1	Mid Term I, Quiz & End Term
8		Characteristics of a good program	Programming Techniques	Lecture	6105.1	Mid Term I, Quiz & End Term
9		Rules/ conventions of coding, documentation, naming variables	Programming Techniques	Lecture	6105.1	Mid Term I, Quiz & End Term
10		Top down & Bottom up design	Programming Techniques	Lecture	6105.1	Mid Term I, Quiz & End Term
11	Fundamentals of C Programming	History & Structure of C program	Introduction to C Programming	Lecture	6105.1	Mid Term I, Quiz & End Term
12		Data Types	Introduction to C Programming	Lecture	6105.2	Mid Term I, Quiz & End Term
13		Data Types	Introduction to C Programming	Lecture	6105.2	Mid Term I, Quiz & End Term
14		Variables & Constants	Using variables & constants in C	Lecture	6105.2	Mid Term I, Quiz & End Term
15		Variables & Constants	Using variables & constants in C	Lecture	6105.2	Mid Term I, Quiz & End Term
16		Tutorial	Tutorial	Tutorial	6105.2	Mid Term I, Quiz & End Term
17		Operators & Expressions	Understanding operators in C	Lecture	6105.2	Mid Term I, Quiz & End Term

18		Operators & Expressions	Understanding operators in C	Lecture	6105.2	Mid Term I, Quiz & End Term
19		Operators & Expressions	Understanding operators in C	Lecture	6105.2	Mid Term I, Quiz & End Term
20		Priority & associativity of operators	Understanding operators in C	Lecture	6105.2	Mid Term I, Quiz & End Term
21		Type conversion	Operations on variables	Lecture	6105.2	Mid Term I, Quiz & End Term
22		Types of errors in C	How to debug C program	Lecture	6105.3	Mid Term I, Quiz & End Term
23		Control Structures	Understanding control structures in C	Lecture	6105.4	Mid Term I, Quiz & End Term
24		Control Structures	Understanding control structures in C	Flipped Class	6105.4	Mid Term I, Quiz & End Term
25	Modular Programming	Introduction to functions & its types	Introduction to Functions	Lecture	6105.5	Mid Term II, Quiz & End Term
26		Creating and using functions	Introduction to Functions	Lecture	6105.5	Mid Term II, Quiz & End Term
27		Passing parameters to functions	Programming with functions	Lecture	6105.5	Mid Term II, Quiz & End Term
28		Returning values from functions	Programming with functions	Lecture	6105.5	Mid Term II, Quiz & End Term
29		Scope & lifetime of variables	Programming with functions	Lecture	6105.5	Mid Term II, Quiz & End Term
30		Static variables	Programming with functions	Lecture	6105.5	Mid Term II, Quiz & End Term
31		Recursion	Programming with functions	Lecture	6105.5	Mid Term II, Quiz & End Term

32		Recursion	Programming with functions	Flipped Class	6105.5	Mid Term II, Quiz & End Term
33	Advanced Programming Techniques	Jump statements in C	Jump statements	Lecture	6105.5	Mid Term II, Quiz & End Term
34		Introduction to pointers	Understanding pointers	Lecture	6105.6	Mid Term II, Quiz & End Term
35		Pointer arithmetic & expressions	Pointer operations	Lecture	6105.6	Mid Term II, Quiz & End Term
36		Pointer to pointer	Pointer operations	Flipped Class	6105.6	Mid Term II, Quiz & End Term
37		Pointer to function, pointer parameter and returning pointer	Using pointer with functions	Lecture	6105.6	Mid Term II, Quiz & End Term
38		Array of pointers	Using pointers with arrays	Lecture	6105.6	Mid Term II, Quiz & End Term
39		Pointer & strings	Using pointers with string	Lecture	6105.6	Mid Term II, Quiz & End Term
40		Pointer & strings	Using pointers with string	Lecture	6105.6	Mid Term II, Quiz & End Term
41		Structures in C	Introduction to structures	Lecture	6105.6	Mid Term II, Quiz & End Term
42		Structures in C	Introduction to structures	Lecture	6105.6	Mid Term II, Quiz & End Term
43		Pointer & Structures	Using pointer with structures	Lecture	6105.6	Mid Term II, Quiz & End Term
44		Pointer & Structures	Using pointer with structures	Lecture	6105.6	Mid Term II, Quiz & End Term

45	Introduction to Data Structures	Introduction to stack	Data structure Using C	Lecture	6105.7	Mid Term II, Quiz & End Term
46		Stack operations	Data structure Using C	Lecture	6105.7	Mid Term II, Quiz & End Term
47		Stack operations	Data structure Using C	Flipped Class	6105.7	Mid Term II, Quiz & End Term
48		Introduction to queues	Data structure Using C	Lecture	6105.7	Mid Term II, Quiz & End Term
49		Operations on queues	Data structure Using C	Lecture	6105.7	Mid Term II, Quiz & End Term
50		Operations on queues	Data structure Using C	Flipped Class	6105.7	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			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7						PSO 1	PSO 2	PSO 3	
CO1	Design Algorithms & Flow Chart, learn how to write good program, understand the rules/conventions of coding, documentation, variable naming.	1	1					1						1	1	1	
CO2	Understand different datatypes and operators and how to use them.	1	1					1						1		1	
CO3	Learn how to debug the programs for logical or syntactical errors.	1	1	1				1						1			
CO4	Learn how to implement various control structures such as conditional and looping statements.	2		1		1	1	2						2	1	1	
CO5	Write reusable programs using functions.	2	1	1	2	1	1	2						2	2	1	
CO6	Understand how to access and manage computers memory for programs using pointers and dynamic memory management techniques.	1					1	1						1	1	1	
CO7	Build analytical & problem solving skills and data structures.	3						2						3	2	2	

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

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

Master of Computer Application

Relational Database Management System | CA 6106 | 4 Credits | 3 1 0 4

Session: Jul - Nov 20 | Faculty: Dr. Timothy Malche | Class: MCA I SEMESTER

Introduction: This course introduces the concepts of Relational Database Management Systems. The emphasis is on understanding the working of database management systems with practical implementation of various database concepts. The course will be taught using MySQL Database and ERD plus.

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

**[CA6106.1].** Describe Database System applications & Database Architecture.

**[CA6106.2].** Recite relational algebra concepts and use it to translate queries to relational algebra.

**[CA6106.3].** Perform various SQL operations.

**[CA6106.4].** Design ER-models to represent database application scenarios.

**[CA6106.5].** Improve the database design by normalization.

**[CA6106.6].** Explain the concept of transaction, concurrency and recovery.

#### **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]** To work productively as IT professional both at supportive and leadership roles.

**[PSO2]** 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.

**[PSO3]** To build their profession adaptable to the changes in the technology with lifelong learning.

### 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

Introduction: Database-System Applications, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture; Relational Algebra: Fundamental RelationalAlgebra Operations, Extended Relational-Algebra Operations, Null Values, Modification of the Database; SQL: Data Definition Language, Data manipulation language , SQL Data Types and Schemas, Integrity Constraints, Basic Structure of SQL Queries, Set Operations, Aggregate Functions, Null Values, Nested Sub-queries, Complex Queries, Views, Modification of the Database, Joined Relations, Authorization, Overview of the Design Process; The Entity-Relationship Model:



Constraints, Entity-Relationship Diagrams, Entity-Relationship Design Issues, Weak Entity Sets, Extended E-R Features; Normalization: Anomalies, Referential integrity, 1NF, Functional Dependency, 2NF, 3NF, BCNF; Hashing Techniques: Dynamic Hashing; Transactions: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Lock-Based Protocols, Log-Based Recovery, Recovery algorithms.

#### **D. Textbook**

1. S. Korth, Database System Concept, Mc-GrawHill, (6e), 2011.

#### **E. Reference Books**

1. R. Elmasri and S. Navathe, Fundamentals of Database Systems, (6e) Pearson Education, 2006.

2. T. Connolly, C. Begg, Database Systems—A Practical Approach to Design, Implementation and Management, (3e) Pearson Education, 2002.

#### **Lecture Plan:**

<b>LEC NO</b>	<b>Major Topic</b>	<b>TOPICS</b>	<b>Session Outcome</b>	<b>Mode of Delivery</b>	<b>Corresponding CO</b>	<b>Mode of Accessing CO</b>
1	Introduction	Understanding CO	Introduction to Course	Lecture	CA6106.1	Mid Term I, Quiz & End Term
2		Introduction to Database	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
3		Understand database design	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
4		DBMS vs RDBMS	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
5		Views of data	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
6		Database structure	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
7		Database applications	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
8		Database architecture	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term

9		Transaction management	Introduction to RDBMS	Lecture	CA6106.1	Mid Term I, Quiz & End Term
10	Relational Algebra	Fundamental operations	Understand relational algebra	Lecture	CA6106.2	Mid Term I, Quiz & End Term
11		Fundamental operations	Understand relational algebra	Lecture	CA6106.2	Mid Term I, Quiz & End Term
12		Derived operations	Understand relational algebra	Lecture	CA6106.2	Mid Term I, Quiz & End Term
13		Derived operations	Understand relational algebra	Lecture	CA6106.2	Mid Term I, Quiz & End Term
14		Extended operations	Understand relational algebra	Lecture	CA6106.2	Mid Term I, Quiz & End Term
15		Extended operations	Understand relational algebra	Lecture	CA6106.2	Mid Term I, Quiz & End Term
16		Tutorial	Tutorial	Tutorial	CA6106.2	Mid Term I, Quiz & End Term
17	Structure query language	Data Definition Language	Understanding SQL	Lecture	CA6106.3	Mid Term I, Quiz & End Term
18		Data Definition Language	Understanding SQL	Flipped Class	CA6106.3	Mid Term I, Quiz & End Term
19		Data manipulation language	Understanding SQL	Lecture	CA6106.3	Mid Term I, Quiz & End Term
20		Data manipulation language	Understanding SQL	Flipped Class	CA6106.3	Mid Term I, Quiz & End Term
21		SQL Data Types and Schemas	Understanding SQL	Lecture	CA6106.3	Mid Term I, Quiz & End Term
22		Constraints	Understanding SQL	Lecture	CA6106.3	Mid Term I, Quiz & End Term

23		Constraints	Understanding SQL	Flipped Class	CA6106.3	Mid Term I, Quiz & End Term
24		SQL Queries	Understanding SQL	Lecture	CA6106.3	Mid Term I, Quiz & End Term
25		SQL Queries	Understanding SQL	Lecture	CA6106.3	Mid Term I, Quiz & End Term
26		Set Operations	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
27		Set Operations	Understanding SQL	Flipped Class	CA6106.3	Mid Term II, Quiz & End Term
28		Aggregate Functions	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
29		Aggregate Functions	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
30		Nested queries	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
31		Nested queries	Understanding SQL	Flipped Class	CA6106.3	Mid Term II, Quiz & End Term
32		Complex queries	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
33		Complex queries	Understanding SQL	Flipped Class	CA6106.3	Mid Term II, Quiz & End Term
34		SQL Joins	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
35		SQL Joins	Understanding SQL	Flipped Class	CA6106.3	Mid Term II, Quiz & End Term
36		Authorization	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term

37		Design Process	Understanding SQL	Lecture	CA6106.3	Mid Term II, Quiz & End Term
38	The Entity-Relationship Model	Entity-Relationship Diagrams	Understanding ER Model	Lecture	CA6106.4	Mid Term II, Quiz & End Term
39		Entity-Relationship Diagrams	Understanding ER Model	Lecture	CA6106.4	Mid Term II, Quiz & End Term
40		Design Issues	Understanding ER Model	Lecture	CA6106.4	Mid Term II, Quiz & End Term
41		Weak Entity Sets	Understanding ER Model	Lecture	CA6106.4	Mid Term II, Quiz & End Term
42		Extended E-R Features	Understanding ER Model	Lecture	CA6106.4	Mid Term II, Quiz & End Term
43	Normalization	Introduction	Understanding normalization	Lecture	CA6106.5	Mid Term II, Quiz & End Term
44		What are Anomalies	Understanding normalization	Lecture	CA6106.5	Mid Term II, Quiz & End Term
45		Referential integrity & Functional Dependency	Understanding normalization	Lecture	CA6106.5	Mid Term II, Quiz & End Term
46		Types of normal forms	Understanding normalization	Lecture	CA6106.5	Mid Term II, Quiz & End Term
47	Hashing Techniques	Dynamic Hashing	Understanding hashing	Lecture	CA6106.5	Mid Term II, Quiz & End Term
48	Transactions	Transaction State & implementing ACID	Understanding transactions	Lecture	CA6106.6	Mid Term II, Quiz & End Term
49		implementing ACID	Understanding transactions	Lecture	CA6106.6	Mid Term II, Quiz & End Term
50		implementing ACID	Understanding transactions	Lecture	CA6106.6	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			
		P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7					PSO 1	PSO 2	PSO 3	
CO1	Describe Database System applications & Database Architecture.	1	1					1					1	1	1	
CO2	Recite relational algebra concepts and use it to translate queries to relational algebra.	1	1					1					1		1	
CO3	Perform various SQL operations.	3	1	1				2					2	1	1	
CO4	Design ER-models to represent database application scenarios.	2		1		1	1	2					1	1	1	
CO5	Improve the database design by normalization.	2	1	1	2	1	1	2					1	1	1	
CO6	Explain the concept of transaction, concurrency and recovery.	1					1	1					1	1	1	

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



**SCHOOL OF BASIC SCIENCE**

**DEPARTMENT OF COMPUTER APPLICATIONS**

**COURSE HAND-OUT**

Operating System | CA 6107 | 4 Credits | 3 | 0 | 4

Session: Oct 2020 – Feb 2021 | Faculty: Dr. Shilpa Kulkarni Sharma | Class: MCA I

**A. Introduction:** This course provides a The primary purpose of machine learning is to discover patterns in the user data and then make predictions based on these and intricate patterns for answering business questions and solving business problems. Machine learning helps in analyzing the data as well as identifying trends.

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

[6107.1]. To introduce the services provided by and the design of an operating system.

[6107.2]. To understand the structure and organization of the file system.

[6107.3]. To recognize Input and Output device management.

[6107.4]. To identify what a process is and how processes are synchronized and scheduled.

[6107.5]. To understand different approaches to memory management.

**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	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20

(Summative)	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 Programs & Operating Systems, Evolution of Operating System (mainframe, desktop, multiprocessor, Distributed, Network Operating System, Clustered & Handheld System), Operating system services, Operating system structure, System Call & System Boots, Operating system design & Implementations, System protection, Buffering & Spooling. Types of Operating System: Bare machine, Batch Processing, Real Time, Multitasking & Multiprogramming, time-sharing system. File: concepts, access methods, free space managements, allocation methods, directory systems, protection, organization ,sharing & implementation issues, Disk & Drum Scheduling, I/O devices organization, I/O devices organization, I/O buffering, I/O Hardware, Kernel I/O subsystem, Transforming I/O request to hardware operations. Device Driver: Path managements, Sub module, Procedure, Scheduler, Handler, Interrupt Service Routine. File system in Linux & Windows Process: Concept, Process Control Blocks (PCB), Scheduling criteria Preemptive & non Preemptive process scheduling, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling, operations on processes, threads, inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization. Deadlock: Characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Process Management in Linux. Memory Hierarchy, Concepts of memory management, MFT & MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation. Structure & implementation of page table. Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation. Distributed operating system:- Types, Design issues, File system, Remote file access, RPC, RMI, Distributed Shared Memory(DSM), Basic Concept of Parallel Processing & Concurrent Programming. Case study of Unix, Linux & Windows.

## E. TEXTBOOK:

1. Silberschatz , "Operating system", Willey Pub.
2. Stuart, "Operating System Principles, Design & Applications", Cengage Learning
3. Tannanbaum, "Modern operating system", PHI Learning
4. Dhamdhare, "Operating System", TMH.

## F. REFERENCES:

1. William stalling, "operating system" Pearson Edu.
2. Deitel & Deitel, "Operating Systems", Pearson Edu.
3. Flynn & Mchoes, "Operating Systems", Cengage Learning

**G. Lecture Plan:**

Lectures	Major Topics	Topics	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1-10	Introduction to System Programs & Operating Systems	Introduction to System Programs & Operating Systems, Evolution of Operating System (mainframe, desktop, multiprocessor, Distributed, Network Operating System, Clustered & Handheld System), Operating system services, Operating system structure, System Call & System Boots, Operating system design & Implementations, System protection, Buffering & Spooling.	Lecture	CA 6107 .1	Mid Term I, Assignment/ Quiz
11-20	File management	Types of Operating System: Bare machine, Batch Processing, Real Time, Multitasking & Multiprogramming, time-sharing system. File: concepts, access methods, free space managements, allocation methods, directory systems, protection, organization ,sharing & implementation issues, Disk & Drum Scheduling, I/O devices organization, I/O devices organization, I/O buffering, I/O Hardware, Kernel I/O subsystem, Transforming I/O request to hardware operations. Device Driver: Path managements, Sub module, Procedure,	Lecture	CA 6107 .2	Mid Term I, Assignment/ Quiz



21-32.	Process Management	<p>Windows Concept, Control Blocks (PCB), Scheduling criteria Preemptive &amp; non Preemptive process scheduling, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling, operations on processes, threads, inter process communication, precedence graphs, critical section problem, semaphores, classical problems of synchronization.</p> <p>Deadlock: Characterization, Methods for deadlock handling, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Process Management in Linux.</p>	Lecture	CA 6107 .3	Mid Term I, Assignment/ Quiz
33-40	Memory Management	<p>Memory Hierarchy, Concepts of memory management, MFT &amp; MVT, logical and physical address space, swapping, contiguous and non-contiguous allocation, paging, segmentation, and paging combined with segmentation.</p> <p>Structure &amp; implementation of page table. Concepts of virtual memory, Cache Memory Organization, demand paging, page replacement algorithms, allocation of frames, thrashing, demand segmentation.</p>	Lecture	CA 6107 .4	Mid Term I, Assignment/ Quiz

41-48	Distributed operating system	Distributed operating system:-Types, Design issues, File system, Remote file access, RPC, RMI, Distributed Shared Memory(DSM), Basic Concept of Parallel Processing &Concurrent Programming. Case study of Unix, Linux & Windows.	Lecture	CA 6107 .5	Mid Term I, Assignment/ Quiz
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#### 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
CA 6107.1	To introduce the services provided by and the design of an operating system.	1	1	1	2	1	3	1	1	3	1
CA 6107.2	To understand the structure and organization of the file system.	1		1	3	1	2	1	1	3	1
CA 6107.3	To recognize Input and Output device management.	2		3	3	1	1		2	1	2
CA 6107.4	To identify what a process is and how processes are synchronized and scheduled.	2	1		3	1			2	1	1
CA6107.5	To understand different approaches to memory management.	1		1	3	1	2	1	1	3	1

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



# MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Department of Computer Applications

Course Hand-out

Graph Theory and Applications | MA 6206 | 3 Credits | 3 0 0 3

Session: Jan 20 – Jun 20 | Faculty: Garima Agarwal | Class: MCA II SEMESTER

- A. **Introduction:** This course aims to discuss basic concept of Graph theory. Course is intended to provide the students the experience in Graph Theory and to emphasize the practical aspects of this theory.
- B. **Course Outcomes:** At the end of the course, students will be able to :

[6206.1]. Identify the types of Graph.

[6206.2]. Demonstrate the concepts of Trees, connectivity and Planarity of Graph

[6206.3]. Understand Matrices, Coloring and Directed Graph

[6206.4]. Find the Permutations and combinations

## 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 computer 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

**Graphs:** Introduction, Isomorphism, Sub graphs, Walks, Paths, Circuits, Connectedness, Components, Euler graphs, Hamiltonian paths and circuits, Trees, Properties of trees, Distance and canter in tree, Rooted and binary trees. **Trees, Connectivity & Planarity** Spanning trees, Fundamental circuits, Spanning trees in a weighted graph, cut sets, Properties of cut set, all cut sets, Fundamental circuits and cut sets, Connectivity and separability, Network flows: Isomorphism, Combinational and geometric graphs, Planer graphs, Different representation of a planer graph. **Matrices, Coloring and Directed Graph.** Chromatic number, Chromatic partitioning, Chromatic polynomial, Matching, Covering, Four color problem, Directed graphs, Types of directed graphs, Digraphs and binary relations, Directed paths and connectedness, Euler graphs. **Permutations & Combinations:** Fundamental principles of counting, Permutations and combinations, Binomial theorem, combinations with repetition, Combinatorial numbers, Principle of inclusion and exclusion, Derangements, Arrangements with forbidden positions.

#### E. TEXT BOOKS

1. N. Deo, *Graph Theory: With Application to Engineering and Computer Science*, (New Edition) Prentice Hall of India, 2003.

#### F. REFERENCE BOOKS

1. R.P. Grimald *Discrete and Combinatorial Mathematics: An Applied Introduction*, (5e) Addison Wesley, 2003.

#### G. Lecture Plan:

Lectures	Major Topics	Topics	Session outcome	Delivery Mode	Corresponding CO	Mode Of Assessing CO
1.	Graphs	Introduction to COS, PSO	Understand PO,CO,PSO	Lecture	NA	Mid Term I, Quiz & End Term
2.		Introduction to Graph Theory	concept of Graph Theory	Lecture	6206.1	Mid Term I, Quiz & End Term
3.		Types of Graph	understanding Graphs	Lecture	6206.1	Mid Term I, Quiz & End Term
4.		Isomorphism of Graph	Types of graph	Lecture	6206.1	Mid Term I, Quiz & End Term
5.		Sub graphs	understanding Sub Graphs	Lecture	6206.1	Mid Term I, Quiz & End Term
6.		Walks, Paths, Circuits of Graph	different types of graph	Lecture	6206.1	Mid Term I, Quiz & End Term
7.		Connectedness & Components of Graph	understanding properties of Graph	Lecture	6206.1	Mid Term I, Quiz & End Term
8.		Euler graphs	Special case of graph	Lecture	6206.1	Mid Term I, Quiz & End Term
9.		Hamiltonian paths and circuits of Graph	basic concept	Lecture	6206.1	Mid Term I, Quiz & End Term
10.		QUIZ-1	evaluation	Activity	6206.1	Mid Term I, Quiz & End Term
11.	Trees, Connectivity & Planarity	Trees of Graph	basic concept of Trees	Lecture	6206.2	Mid Term I, Quiz & End Term
12.		Properties of Trees	understanding Trees	Lecture	6206.2	Mid Term I, Quiz & End Term

13.		Introduction of cut set	basic concept of cut set	Lecture	6206.2	Mid Term I, Quiz & End Term
14.		properties of cut set	understanding properties of	Lecture	6206.2	Mid Term I, Quiz & End Term
15.		Connectivity and seperability	types of cut set	Lecture	6206.2	Mid Term I, Quiz & End Term
16.		Introduction of Network flows	basic concept of Network	Lecture	6206.2	Mid Term I, Quiz & End Term
17.		Properties and type of Network flows	understanding Network flows	Lecture	6206.2	Mid Term I, Quiz & End Term
18.		Planer graphs	basic concept of Planer	Lecture	6206.2	Mid Term II, Quiz & End Term
19.		Properties of Planer graphs	use of planer graph	Lecture	6206.2	Mid Term II, Quiz & End Term
20.		QUIZ-2	evaluation	Activity	6206.2	Mid Term II, Quiz & End Term
21.	Matrices, Coloring and Directed Graph	Introduction of Chromatic number	basic concept of Chromatic number	Lecture	6206.3	Mid Term II, Quiz & End Term
22.		Introduction of Chromatic polynomials	introduction of Chromatic polynomials	Lecture	6206.3	Mid Term II, Quiz & End Term
23.		Four color problem	concept of color problems	Lecture	6206.3	Mid Term II, Quiz & End Term
24.		Introduction of Directed graphs	basic concept of Directed	Lecture	6206.3	Mid Term II, Quiz & End Term
25.		Types of directed graphs	understanding directed	Lecture	6206.3	Mid Term II, Quiz & End Term
26.		Directed paths	introduction of Directed paths	Lecture	6206.3	Mid Term II, Quiz & End Term
27.		connectedness of Directed paths	types of Directed paths	Lecture	6206.3	Mid Term II, Quiz & End Term
28.		QUIZ-3	evaluation	Activity	6206.3	Mid Term II, Quiz & End Term
29.	Permutations & Combinations	Fundamental principles of counting	introduction of counting	Lecture	6206.4	Mid Term II, Quiz & End Term
30.		Introduction of Permutations	understanding of Permutations	Lecture	6206.4	Mid Term II, Quiz & End Term
31.		Introduction of combinations	Basic concept of combinations	Lecture	6206.4	Mid Term II, Quiz & End Term
32.		Binomial theorem	understanding of combinations	Lecture	6206.4	Mid Term II, Quiz & End Term
33.		combinations with repetition	understanding of combinations	Lecture	6206.4	Mid Term II, Quiz & End Term
34.		Combinatorial numbers	concept of Combinatorial	Lecture	6206.4	Mid Term II, Quiz & End Term
35.		Principle of inclusion and exclusion	Basic properties	Lecture	6206.4	Quiz & End Term
36.		Derangements	concept of Derangements	Lecture	6206.4	Quiz & End Term
37.		Arrangements with forbidden positions	concept of forbidden	Lecture	6206.4	Quiz & End Term
38.		Virtual Constructor & virtual destructor	properties	Lecture	6206.4	Quiz & End Term
39.		QUIZ-4	evaluation	Activity	6206.4	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 6206.1	Identify the types of Graph.	1					1		2						1		
MA 6206.2	Demonstrate the concepts of Trees, connectivity and Planarity of Graph			2		1									2		1
MA 6206.3	Understand Matrices, Coloring and Directed Graph	2					1									1	
MA 6206.4	Find the Permutations and combinations		1											1			

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

# MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications

Course Hand-out

Design and Analysis of Algorithms | CA 6202 | 4 Credits | 3 | 0 4

Session: Jan –May 2020| Faculty: Dr. Shilpa Kulkarni Sharma | Class: MCA II SEMESTER

**A. Introduction:** This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms, advanced data structures, graph algorithms (shortest path, spanning trees, tree traversals), string matching, elements of computational geometry, NP completeness.

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

6202.1 To analyze and design algorithms and to appreciate the impact of algorithm design in practice.  
6202.2 Define tree data structure and related methods.

6202.3 Understand divide and conquer and greedy algorithms and application.

6202.4 Define the dynamic programming and graph traversal techniques; its impact and implementation.

6202.5 Comprehend the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems and randomized algorithms

## 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: To work productively as IT professional both at supportive and leadership roles.

PSO2: 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.

PSO3: 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 (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes	20
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:** Algorithm Analysis: A priori and a posteriori Analysis, Time Space Tradeoff, Asymptotic Notations, Properties of asymptotic notations, Recurrence equations, Solving recurrence equations using Substitution method and Master's method; Trees: B-Tree, Red Black Tree; Divide and Conquer: Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Matrix Multiplication; Greedy Algorithms: Knapsack Problem, Job Sequencing with deadline, Optimal Merge Pattern, Single Source Shortest Path, Minimum Cost Spanning tree; Dynamic Programming: Multistage Graphs, Matrix Chain Multiplication, All Pair shortest paths, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem, Graph Traversals, Connected Components, Spanning Trees, Bi-connected components; Complexity Classes: Introduction to NP-Hard and NP-Completeness; Approximation Algorithm, Randomized Algorithm.

#### **F. Text Book(s):**

1. Horowitz and Sahni, Fundamental of Computer Algorithms, (2e) Galgotia Publications, 2008.

#### **G. Reference(s):**

1. E. Horowitz, S. Sahni and S. Rajasekaran, Computer Algorithms, (2e), University Press, 2007.
2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, Introduction to Algorithms, (3e), MIT press, 2009.



### H. Lecture Plan:

Lecture	Major Topic	Topics	Session Outcome	Mode of Delivery	Corres pondin g CO	Mode of Assessin g the Outcom e
1.	Algorithm Analysis	A priori and a posteriori Analysis, Time Space Tradeoff	To familiarize with algorithms and notations	Lecture	6202.1	Class Quiz Mid Term I
2.		Asymptotic Notations		Lecture	6202.1	
3-4		Properties of asymptotic notations		Lecture	6202.1	
5-7		Recurrence equations		Lecture	6202.1	End Term
8-12		Solving recurrence equations using Substitution method and Master’s method		Lecture	6202.1	
				Lecture	6202.1	
13-17	Trees	B-Tree, Red Black Tree	To learn advance tree concepts and algorithms.	Lecture	6202.2	Class Quiz Mid Term I  End Term
				Lecture	6202.2	
				Lecture	6202.2	
				Lecture	6202.2	
				Handou ts	6202.2	
				Lecture	6202.2	
				Lecture	6202.2	
				Lecture	6202.2	
18-19	Divide and Conquer	Binary Search,	Understan d divide and conquer methods and its application	Lecture	6202.3	Class Quiz Mid Term II End Term
20-23		Finding Maximum and Minimum		Lecture	6202.3	
24-25		Merge Sort		Lecture	6202.3	
26-27		Quick Sort,		Lecture	6202.3	
28-30		Matrix Multiplication		Lecture	6202.3	
				Lecture	6202.3	

31-38	<b>Greedy Algorithms</b>	Knapsack Problem, Job Sequencing with deadline, Optimal Merge Pattern, Single Source Shortest Path, Minimum Cost Spanning tree	Illustrate the various greedy algorithms	Lecture	6202.3	Class Quiz Mid Term II End Term
39-46	<b>Dynamic Programming and Graphs</b>	Multistage Graphs, Matrix Chain Multiplication, All Pair shortest paths, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem, Graph Traversals, Connected Components, Spanning Trees, Bi-connected components	Identify	Lecture	6202.4	
47-48		Graph Traversals, Connected Components, Spanning Trees, Bi-connected components			6202.4	
49-52	<b>Complexity Classes</b>	Introduction to NP-Hard and NP-Completeness; Approximation Algorithm, Randomized Algorithm.	Introduce the classes P, NP and NP-complete problems and randomized algorithms	Lecture	6202.5	Class assignments 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	PSO 3	PO 3	PO 4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3
CC 6202.1	To analyze and design algorithms and to appreciate the impact of algorithm design in practice.	2			2	3			1		
CC 6202.2	Define tree data structure and related methods.		2		3	2				1	1

CC 6203.3	Understand greedy algorithms and application.	2	3	2		1	1		1	1	
CC 6204.4	Define the dynamic programming and its impact and implementation				2		1			1	
CC 6205.5	Comprehend the concepts of tractable and intractable problems and the classes P, NP and NP-complete problems and randomized algorithms	3		3			2	1	2	1	1



# MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications

Course Hand-out

Computer Networks & Protocols | CA 6203 | 4 Credits | 3104

Session: Jan- June 2020 | Faculty: Devershi Pallavi Bhatt | Class: MCA- Sem II

**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

[CA 6203.1]: Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.

[CA 6203.2]: Analysis and Implement the Routing and its types.

[CA 6203.3]: Demonstrate the Internet control protocols, IPV6 transitions.

[CA 6203.4]: Analyse the Transport Layer and Its protocols, congestion control.

[CA 6203.5]: Describe the Application Layer, its protocols and Network Security.

**B. 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 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

**[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

### 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)	20
End Term Exam (Summative)	End Term Exam (Open 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

Network introduction: Classful addressing, other issues, Subnetting Classless addressing, variable length blocks, Subnetting, address allocation, Network Address Translation. Encapsulation, operation Data Link Layer: ARP package & RARP- Introduction, packet format Encapsulation, RARP server datagram, fragmentation, options, checksum, Network Layer: IP Package Types of messages, message format, error reporting, Query, Checksum, Debugging tools; Transport Layer: Process to process communication, User datagram, checksum, UDP operation UDP package Introduction, TCP services, TCP features, segment, TCP connection, State transition diagram, Flow control, Error control, Congestion control, TCP timers, options, TCP package; TCP Variants: SCTP services, SCTP features, packet format, association, state transition diagram, flow control, error control, congestion control, TCP RENO, Dynamic routing protocols : RIP,OSCF & BGP; Domain name Space (Application Layer): Name space, distribution of name space, DNS in the internet, resolution, DNS messages, controlling the server, out of band signaling, escape character. Transition from IPv4 to IPv6. Introduction to VLAN concept, Wireless Network protocols: WAP Architecture introduction. Introduction to MANET & VANET

#### TEXT BOOKS:

1. A S Tanenbaum, Computer Networks, 5<sup>th</sup> Ed., Pearson, 2010.
2. B.A. Forouzan, TCP/IP Protocol Suite, 4<sup>th</sup> Ed., TMH, 2010.

#### REFERENCE BOOK:

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

**E. Lecture Plan:**

Lecture No	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Network introduction	Introduction to the subject	Understand POs, PSOs and COs	Lecture	6203.1	Mid Term I, Quiz & End Term
2		Introduction to network Layer: Network Layer Design Issues: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service	Understand Network Layer and its functions	Lecture	6203.1	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	Understand Characteristics of Network Layer	Lecture	6203.1	Mid Term I, Quiz & End Term
4	Routing Algorithms	Routing Algorithms; Characteristics and Types, The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing,	Define Routing Algorithm	Lecture	6203.2	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,	Define Routing Algorithm	Lecture	6203.2	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,	Discuss routing algorithms	Lecture	6203.2	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,	Discuss routing algorithms	Lecture	6203.2	Mid Term I, Quiz & End Term
8	Internetworking	Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	Explain Internetworking	Lecture	6203.2	Mid Term I, Quiz & End Term
9		Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	Explain Internetworking and Routing	Lecture	6203.2	Mid Term I, Quiz & End Term
10		Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	Find Route through CIDR	Lecture	6203.2	Mid Term I, Quiz & End Term
11		Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	Find Route through Classless routing	Lecture	6203.3	Mid Term I, Quiz & End Term

12		Internetworking; IP Addresses, Subnets, CIDR—Classless InterDomain Routing, NAT—Network Address Translation	Analyse NAT	Lecture	6203.3	Mid Term I, Quiz & End Term
13	Network Layer Protocols	DHCP, ARP, RARP, ICMP, IPV4 and IPV6 header format	Classify various routing protocols	Lecture	6203.3	Mid Term I, Quiz & End Term
14		DHCP, ARP, RARP, ICMP, IPV4 and IPV6 header format	Classify various routing protocols	Lecture	6203.3	Mid Term I, Quiz & End Term
15		Fragmentation	Explain Fragmentation	Lecture	6203.2	Mid Term I, Quiz & End Term
16		RIP, OSPF, BGP	Classify various routing protocols	Lecture	6203.2	Mid Term I, Quiz & End Term
17		RIP, OSPF, BGP	Classify various routing protocols	Tutorial	6203.2	Mid Term I, Quiz & End Term
18	Congestion Control	Congestion Control Algorithms; General Principles of Congestion Control, Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets	Understand Congestion Control Algorithms	Tutorial	6203.1	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	Understand General Principles of Congestion Control	Tutorial	6203.1	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	Illustrate the Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets	Tutorial	6203.1	Mid Term I, Quiz & End Term



21	Quality of Service	Quality of Service; Requirements, Techniques for Achieving Good Quality of Service (till Packet Scheduling as per Tannenbaum)	Explain Quality of Service	Tutorial	6203.1	Mid Term I, Quiz & End Term
22		Quality of Service; Requirements, Techniques for Achieving Good Quality of Service (till Packet Scheduling as per Tannenbaum)	Explain techniques for Achieving Good Quality of Service	Tutorial	6203.1	Mid Term I, Quiz & End Term
23		Quality of Service; Requirements, Techniques for Achieving Good Quality of Service (till Packet Scheduling as per Tannenbaum)	Explain techniques for Achieving Good Quality of Service	Tutorial	6203.2	Mid Term I, Quiz & End Term
		<b>First Sessional Examination</b>		Tutorial		
24	Transport Layer	Transport Layer; Introduction to Transport Layer, Transport Service Primitives	Understand Transport Layer	Tutorial	6203.4	Mid Term II, Quiz & End Term
25		Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	Understand Transport Layer Protocols	Tutorial	6203.4	Mid Term II, Quiz & End Term
r26		Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	Discuss the process of connection	Tutorial	6203.4	Mid Term II, Quiz & End Term
27		Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	Understand flow control and buffering	Tutorial	6203.4	Mid Term II, Quiz & End Term

28		Elements of Transport Protocols; Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing	Articulate buffering and Multiplexing	Tutorial	6203.4	Mid Term II, Quiz & End Term
29	Transport Layer Protocols	UDP; UDP Header; Introduction to TCP	Understand UDP	Tutorial	6203.4	Mid Term II, Quiz & End Term
30		The TCP Service Model, The TCP Protocol, The TCP Segment Header,	Understand TCP Service Model	Tutorial	6203.4	Mid Term II, Quiz & End Term
31		The TCP Service Model, The TCP Protocol, The TCP Segment Header,	Understand TCP Segment header and its each field	Tutorial	6203.4	Mid Term II, Quiz & End Term
32		TCP Connection Establishment, TCP Connection Release	Understand TCP Connection	Flip Class	6203.4	Mid Term II, Quiz & End Term
33		TCP Transmission Policy; Window Management, Connection Control, Timer Management	Identify TCP window and Timer Management	Lecture	6203.4	Mid Term II, Quiz & End Term
34		TCP Transmission Policy; Window Management, Connection Control, Timer Management	Describe the Connection Control, Timer Management	Lecture	6203.4	Mid Term II, Quiz & End Term
35		TCP Transmission Policy; Window Management, Connection Control, Timer Management	Describe the Connection Control, Timer Management		6203.4	Mid Term II, Quiz & End Term
36		Introduction to Application Layer; DNS—The Domain Name System	Explain Application Layer	Flip Class	6203.5	Mid Term II, Quiz & End Term
37	Application Layer	Introduction to Application Layer; DNS—The Domain Name System	Recognize DNS	Lecture	6203.5	Mid Term II, Quiz & End Term
38	Application Layer Protocols	Electronic Email; SMTP, POP, IMAP, MIME	Illustrate Email	Tutorials	6203.5	Mid Term II, Quiz & End Term
39		Electronic Email; SMTP, POP, IMAP, MIME	Illustrate Email and its protocols	Flip Class	6203.5	Mid Term II, Quiz & End Term

40		HTTP, HTTPS	Understand Hypertext protocols	Lecture	6203.5	Mid Term II, Quiz & End Term
41		HTTP, HTTPS	Compare HTTP and HTTPS	Lecture	6203.5	Mid Term II, Quiz & End Term
42		SNMP	Discuss Network Management Protocol	Lecture	6203.5	Mid Term II, Quiz & End Term
		<b>Second Sessional Examination</b>				
43	Introduction to VLAN concept	Wireless Network protocols	Explain Wireless Protocols	Tutorial	6203.5	Quiz & End Term
44		WAP Architecture introduction.	Understand WAP architecture	Flip Class	6203.5	Quiz & End Term
45		Introduction to MANET & VANET	Understand MANET and VANET	Flip Class	6203.5	Quiz & End Term

**F. 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
CA6203.1	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.	3		1				3	3	2	2
CA6203.2	Implement the Routing and its types	1		1				2	3	1	3
CA6203.3	Demonstrate the Internet control protocols, IPV6 transitions.	1						1	2	2	1
CA6203.4	Analyse the Transport Layer and Its protocols, congestion control.	1						3	2	2	1
CA6203.5	Describe the Application Layer, its protocols and Network Security.	2	1	1			3	2	3	1	2



# MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Application

Course Hand-out

**Object Oriented Programming Using JAVA | CA 6104 | 3 Credits | 3 1 0 4**

Session: July 19 – Dec 19 | Faculty: Linesh Raja | Class: MCA (I 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

**[6104.1].** Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface and other tools.

**[6104.2].** Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.

**[6104.3].** Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

**[6104.4].** Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

**[6104.5].** 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.

**[6104.6].** 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].** 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

**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;** **Introduction to AWT:** Classes, component, Container, Panel, Window, frame, Canvas, working with frame, working with Graphics, using AWT 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 (10<sup>th</sup> 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 (4<sup>th</sup> Edition), By 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	6104.1	In Class Quiz ( Not Accounted)
3		How java changed the internet	Java and Internet	Lecture	6104.1	In Class Quiz End Term
4		Java's Magic, The java Buzzwords	About Java	Guided Self-Study	6104.1	Home Assignment End Term
5		An Overview of Java	About Java	Lecture	6104.2	In Class Quiz End Term
6		Arrays	Array and their initialization	Activity	6104.2	Class Quiz Mid Term I End Term
7-8	Class & Objects	Class fundamentals, Class fundamentals, Declaring objects	Class & Object	Lecture	6104.2	Class Quiz Mid Term I End term
9		Assigning Object reference variable	Object referencing	Lecture	6104.2	Home Assignment Class Quiz Mid Term I End Term
10		Introduction to methods	Member methods	Activity	6104.2	Class Quiz Mid Term I End Term
11		Constructors	Initialization and their use	Lecture	6104.2	Class Quiz Mid Term I End Term
12		this keyword	Various aspects of this keyword	Lecture	6104.2	Class Quiz End Term
13		Garbage collection	De-allocation of memory	Lecture	6104.4	Class Quiz Mid Term II End Term
14		finalize() method	Uses of method	Lecture	6104.4	Class Quiz Mid Term II End Term
15		Overloading	Concept of overloading	Lecture	6104.4	Class Quiz Mid Term II End Term
16-17		Objects as parameters, Argument	Object passing	Lecture	6104.4	Class Quiz



		passing, Returning objects				Mid Term II End Term
18		Recursion	Use of recursion in class & object	Lecture	6104.4	Class Quiz End Term
19	Java Concepts and their applications	Access control, Final	Use of various access and final keyword	Lecture	6104.4	Class Quiz End Term
20		Nested and inner classes	Uses and their applications	Lecture	6104.4	Class Quiz End Term
21		String class	Uses and their applications	Lecture	6104.4	Class Quiz End Term
22		Reading Console Input, Writing Console Output, Files	Uses and their applications	Lecture	6104.5	Class Quiz End Term
23-24		Applet fundamentals	Introduction	Lecture	6104.5	Class Quiz End term
25-26		Inheritance Basic, super, multilevel hierarchy	Uses and their applications	Lecture	6104.5	Class Quiz
27-28		Overriding, abstract classes, final with inheritance, Packages and Interfaces	Uses and their applications	Lecture	6104.5	Class Quiz Mid Term II End Term
29		Exception Handling	Uses and their applications	Lecture	6104.3 6104.5	Class Quiz Mid Term II End Term
30-31		Multithreaded programming; String Handling, Applet Class, Event Handling	Uses and their applications	Lecture	6104.3 6104.5	Class Quiz Mid Term II End Term
32-33		AWT and their classes	Uses and their applications	Lecture	6104.3 6104.5	Class Quiz End Term
34		Swing classes, component, Container	Uses and their applications	Lecture	6104.4 6104.6	Class Quiz End Term
35-36		Panel, Window, frame, Canvas, working with frame	AWT based application development	Lecture	6104.6	Class Quiz End Term
37-38		Working with Graphics	Application development	Lecture	6104.6	Class Quiz End Term
39-41		Swing Controls	Application development	Lecture	6104.6	Class Quiz End Term
42		Revision	Discussion of course outcome	Lecture	NA	NA
LAB SESSIONS		Lab sessions based on object oriented programming concepts. Applets, AWT and Swing based application development		Lab Sessions	6104.1 - 6104.6	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 6104.1	Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface and tools.	3						1			2
CA 6104.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.		2	2							2
CA 6104.3	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.				2	2			3		
CA 6104.4	Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.						2		3		
CA 6104.5	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 6104.6	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 6104.1	Understand object oriented programming and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface and tools.										
CA 6104.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.										
CA 6104.3	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.										
CA 6104.4	Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.										
CA 6104.5	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 6104.6	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

Masters of Computer Application

Course Hand-out

Data Science | CA 6240-3003 | 3 Credits | 3 1 0 4

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

**Introduction:** This course will introduce students to the fundamental concepts Data Science. Main objective of the course is to familiarize students about core concepts data, data mining and its implementation through python. This course has broad insight, understanding and intuition of the whole process line of extracting knowledge from data. It also has solid knowledge in a broad range of methods based on statistics and informatics and can use these for data management, analysis and problem solving. After completion of course of Students will have experience in deriving theoretical properties of methods involved in Data Science and implementation/modification of methods involved in Data Science.

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

[6240-3003.1] Understanding basic concepts of data, data science, types of data, source of data and APIs

[6240-3003.2] Illustrate and practice of Statistical and Data mining techniques

[6240-3003.3] Understand the basic concepts, tools & techniques of Data visualization

[6240-3003.4] Implementation of data science techniques and algorithm through Bokeh/Python

## 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] To work productively as IT professional both at supportive and leadership roles.

[PSO2] 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.

[PSO3] To build their profession adaptable to the changes in the technology with lifelong learning.

**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**

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications. Data collection and management (ETL): Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources, Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes. Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings. Applications of Data Science: Technologies for visualization, Bokeh (Python) Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

**D. TEXT BOOKS**

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline, .O’Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1 , Cambridge University Press

**E. REFERENCE BOOKS**

1. Chun, W. (2001). *Core python programming* (Vol. 1). Prentice Hall Professional.

**Lecture Plan:**

LEC NO	Major Topic	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Accessing CO
1	Introduction about Data	Subject Introduction	Understanding CO & PO	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
2		Introduction about data and processing	Basic concepts of Data	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
3	Nature of Data	Data Science process	Basic concepts of Data Science	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
4		Toolkit of data science	Basic concepts of Data Science	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
5		Types of Data	Data Types	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
6		Examples of data processing application	Data Types	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
7	Tutorial	Tutorial	Tutorial	Tutorial	6240-3003 .1	Mid Term I, Quiz & End Term
8	Data Collection	Data Collection and Management	Source of Data	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
9		Sources of Data	Source of Data	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
10		Data Collections Techniques	Source of Data	Flipped Class	6240-3003 .1	Mid Term I, Quiz & End Term
11		APIs of Data	Source of Data	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
12		Exploring of Data	Source of Data	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
13		Fixing of Data	Source of Data	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
14	Data Storage	Data Storage	Data Storage	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
15		Data Storage and Management	Data management	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term

16		Multiple Data Sources	Data management	Lecture	6240-3003 .1	Mid Term I, Quiz & End Term
17	Statistical Techniques	Introduction to Data Analysis and Statistics	Introduction to Statistical Technique	Lecture	6240-3003 .2	Mid Term I, Quiz & End Term
18		Central Tendency and Distributions	Practice of Statistical Technique	Lecture	6240-3003 .2	Mid Term I, Quiz & End Term
19		Variance and Distribution Properties	Practice of Statistical Technique	Lecture	6240-3003 .2	Mid Term I, Quiz & End Term
20		Samples/CLT	Practice of Statistical Technique	Lecture	6240-3003 .2	Mid Term I, Quiz & End Term
21	Machine Learning	Basic Machine Learning Algorithms	Machine Learning	Lecture	6240-3003 .2, 6240-3003 .3	Mid Term I, Quiz & End Term
22	Statistical Techniques	Linear Regression	Practice of Statistical Technique	Lecture	6240-3003 .2	Mid Term II, Quiz & End Term
23	Data Mining Algorithm	SVM	Understanding Data mining Algorithm	Lecture	6240-3003 .2	Mid Term II, Quiz & End Term
24		Naïve Bayes	Understanding Data mining Algorithm	Lecture	6240-3003 .2	Mid Term II, Quiz & End Term
25	Data visualization	Introduction to Data Visualization	Data visualization	Lecture	6240-3003 .2, 6240-3003 .3	Mid Term II, Quiz & End Term
26		Data for visualization: Data types, Data encodings	Types of Data visualization	Lecture	6240-3003 .3	Mid Term II, Quiz & End Term
27		Retinal variables, mapping variables to encodings	Techniques of Data Visualization	Lecture	6240-3003 .3	Mid Term II, Quiz & End Term
28		Visual encodings	Techniques of Data Visualization	Lecture	6240-3003 .3	Mid Term II, Quiz & End Term
29		Introduction to Applications of Data Science	Techniques of Data Visualization	Lecture	6240-3003 .3	Mid Term II, Quiz & End Term
30		Technologies for visualization	Techniques of Data Visualization	Lecture	6240-3003 .3	Mid Term II, Quiz & End Term
31		II-Technologies for visualization	Techniques of Data Visualization	Lecture	6240-3003 .3	Mid Term II, Quiz & End Term
32	Application Development	Implementation of Analysis Techniques through Python	Data Science through Python	Lecture	6240-3003 .4	Mid Term II, Quiz & End Term

33	Methods done through Python	Implementation of Visualization Techniques through Python	Data Science through Python	Lecture	6240-3003 .4	Mid Term II, Quiz & End Term
34		Application development methods used in Data Science	Data Science through Python	Flipped Class	6240-3003 .4	Mid Term II, Quiz & End Term
35		Implementation through Python	Data Science through Python	Lecture	6240-3003 .4	Mid Term II, Quiz & End Term
36	Tutorial	Tutorial	Tutorial	Tutorial	6240-3003 .1,2,3,4	Mid Term II, Quiz & End Term
37		Tutorial	Tutorial	Tutorial	6240-3003 .1,2,3,4	Mid Term II, 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 6240-3003 .1	Understanding basic concepts of data, data science, types of data, source of data and APIs	3		1	2			2						1		
CA 6240-3003 .2	Illustrate and practice of Statistical and Data mining techniques		2	3		3		1							3	
CA 6240-3003 .3	Understand the basic concepts, tools & techniques of Data visualization	1		1	1	3								3		
CA 6240-3003 .4	Implementation of data science techniques and algorithm through Bokeh/Python		1		2		3	2								2

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



# MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Computer Applications

Course Hand-out

DATA MINING AND WAREHOUSING| CA 7101| 4 Credits | 3 | 0 4

Session: August '20 – Nov '20 | Faculty: Dr. Pradeep Kumar Tiwari| Class: Department Core Course

**A. Introduction:** This course aims to discuss concepts and terminology associate with Statistics, Database Systems and machine learning. The course also discuss the pseudo code and data structures use in the multidimensional arrays for data mining tasks.

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

- [7101.1] Interpret the contribution of data warehousing and data mining to the decision-support level of organizations
- [7101.2] Categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis
- [7101.3] Design and implement systems for data mining
- [7101.4] Evaluate the performance of different data-mining algorithms
- [7101.5] Propose data-mining solutions for different 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

## Program specific outcomes

- 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 (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: Databases, Data Warehouses, Transactional databases, advanced database system and its applications, Data mining Functionalities: Concept/Class description, Association Analysis classification & Prediction, Cluster Analysis, Outlier Analysis, Evolution Analysis, Classification of Data Mining Systems, Major Issues in Data Mining.

Data Warehouse and OLAP Technology for Data Mining: Differences between Operational Database Systems and Data Warehouses, a multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology.

Data Pre-processing: Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation. Data Mining Primitives, Languages, and System Architectures, Concept Description: Characterization and Comparison, Analytical Characterization.

Mining Association Rules in Large Databases: Association Rule Mining, Market Basket Analysis, Basic Concepts, Mining Single-Dimensional Boolean Association Rules from Transactional Databases: the Apriori algorithm, Generating Association rules from frequent items, Improving the efficiency of Apriori, Mining Multilevel Association Rules, Multidimensional Association Rules, Constraint-Based Association Mining.

Classification & Prediction and Cluster Analysis: Issues regarding classification & prediction, Different Classification Methods, Prediction, Cluster Analysis, Major Clustering Methods, Applications & Trends in Data Mining: Data Mining Applications, currently available tools.

## F. Reference Books:

J. Han and M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Pub.

Berson, Dataware housing, Data Mining & DLAP, @004, TMH.

W.H. Inmon "Building the Datawarehouse, 3ed, Wiley India.

Anahory, "Data Warehousing in Real World", Pearson Education.

Adriaans, "Data Mining", Pearson Education.

S.K. Pujari, "Data Mining Techniques", University Press, Hyderabad..

## G. Lecture Plan:

Lectures	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1-2	Introduction: Databases, Data Warehouses,	Understanding the introduction: Databases and Data Warehouses,	Lecture	7101.1	Mid Term I, Quiz & End Term
3	Transactional databases, advanced database system and its applications,	Learn transactional databases, advanced database system and its applications,	Flipped Class	7101.1	Mid Term I, Quiz & End Term
4	Data mining Functionalities: Concept/Class description,	Develop the concept of data mining Functionalities: Concept/Class description,	Lecture	7101.1	Mid Term I, Quiz & End Term
5	Association Analysis classification & Prediction, Cluster Analysis,	Learn the association Analysis classification & Prediction, Cluster Analysis,	Flipped Class	7101.1	Mid Term I, Quiz & End Term
6	Outlier Analysis, Evolution Analysis,	Understand the outlier Analysis, Evolution Analysis,	Lecture	7101.1	Mid Term I, Quiz & End Term
7	Classification of Data Mining Systems, Major Issues in Data Mining.	Understand and use of classification of Data Mining Systems, Major Issues in Data Mining.	Lecture	7101.1	Mid Term I, Quiz & End Term
8	Data Warehouse and OLAP Technology for Data Mining	Learn the use of Data Warehouse and understands the OLAP Technology for Data Mining	Lecture	7101.1 & 7101.2	Mid Term I, Quiz & End Term
9-10	Differences between Operational Database Systems and Data Warehouses, A multidimensional Data Model	Understand the differences between Operational Database Systems and Data Warehouses, A multidimensional Data Model	Lecture	7101.1 & 7101.2	Mid Term I, Quiz & End Term
11	Data Warehouse Architecture	Understand the design and concept of data Warehouse Architecture	Lecture	7101.1 & 7101.2	Mid Term I, Quiz & End Term
12	Data Warehouse Implementation, Data Cube Technology	Learn the data Warehouse Implementation, Data Cube Technology	Lecture	7101.2	Mid Term I, Quiz & End Term
13	Data Pre-processing: Data Cleaning,	Learn the purpose of data Pre-processing: Data Cleaning,	Lecture	7101.2	Mid Term I, Quiz & End Term
14	Data Integration and Transformation, Data Reduction	Learn the features of data Integration and Transformation, Data Reduction,	Lecture	7101.2	Mid Term I, Quiz & End Term

15	Discretization and Concept Hierarchy Generation.	Understand the discretization and Concept Hierarchy Generation.	Lecture	7101.2	Mid Term I, Quiz & End Term
16-17	Data Mining Primitives, Languages, and System Architectures	Understand the Data Mining Primitives, Languages, and System Architectures	Lecture		
18	Concept Description: Characterization and Comparison, Analytical Characterization	Understand the Concept Description: Characterization and Comparison, Analytical Characterization	Lecture		
19-20	Languages, and System Architectures, Concept Description	Learn the concept Languages, and System Architectures, Concept Description to better use of data mining	Lecture	7101.2	Mid Term II, Quiz & End Term
21-22	Characterization and Comparison, Analytical Characterization	Understand the characterization and Comparison, Analytical Characterization	Lecture	7101.2	Mid Term II, Quiz & End Term
23	Mining Association Rules in Large Databases: Association Rule Mining.	Learn the rule of Mining Association in Large Databases:	Lecture	7101.2	Mid Term II, Quiz & End Term
24-25	Market Basket Analysis, Basic Concepts, Mining Single-Dimensional Boolean Association Rules from Transactional Databases	Learn the market Basket Analysis, Basic Concepts, Mining Single-Dimensional Boolean Association Rules from Transactional Databases	Lecture	7101.2	Mid Term II, Quiz & End Term
26	The Apriori algorithm, Generating Association rules from frequent items	The Apriori algorithm, Generating Association rules from frequent items	Lecture	7101.2 & 7101.3	Mid Term II, Quiz & End Term
27	Improving the efficiency of Apriori	Learn how to Improving the efficiency of Apriori	Flipped Class & Lecture	7101.2 & 7101.3	Mid Term II, Quiz & End Term
28	Mining Multilevel Association Rules, Multidimensional	Learn Mining Multilevel Association Rules, Multidimensional	Lecture	7101.5	Mid Term II, Quiz & End Term
29-30	Association Rules,	Learn Association Rules,	Lecture	7101.5	Mid Term II, Quiz & End Term
31	Constraint-Based Association Mining	Understand the concept of constraint-Based Association Mining	Lecture	7101.4 & 7101.5	Mid Term II, Quiz & End Term
32-33	Classification & Prediction and Cluster Analysis:	Learn and understand the classification & Prediction and Cluster Analysis:	Flipped Class & Lecture	7101.5 & 7101.6	Mid Term II, Quiz & End Term
34-36	Issues regarding classification & prediction	Lear about the issues regarding classification & prediction	Lecture	7101.5 & 7101.6	Mid Term II, Quiz & End Term
37-38	Different Classification Methods	Understand the different Classification Methods	Lecture	7101.5 & 7101.6	Mid Term II, Quiz & End Term
39-40	Prediction, Cluster Analysis	Understand the advantage of prediction, Cluster Analysis	Lecture	7101.6	Quiz & End Term
41-43	Major Clustering Methods	Understand the Major Clustering Methods,	Lecture	7101.6	Quiz & End Term
44-45	Applications & Trends in Data Mining	Understand the Applications & Trends in Data Mining	Flipped Class &	7101.5 & 7101.6	Quiz & End Term

			Lecture		
46-49	Data Mining Applications, currently available tools	Analysis the Data Mining Applications, and learn about currently available tools	Lecture	7101.5 & 7101.6	Quiz & End Term

### H. 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 7101.1	Interpret the contribution of data warehousing and data mining to the decision-support level of organizations	1		1						2	
CA 7101.2	Categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis	3	2					2	3		
CA 7101.3	Design and implement systems for data mining	2	1			1	1	3		3	
CA 7101.4	Evaluate the performance of different data-mining algorithms	1		1		1	2	2	2		
CA 7101.5	Propose data-mining solutions for different applications	3			1		3	1			3

**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

Cloud Computing & Infrastructure Services| CA 7102| 4 Credits | 3 | 0 | 4

Session: August '20 – Nov '20 | Faculty: Dr. Pradeep Kumar Tiwari| Class: Department Core Course

**A. Introduction:** This course is offered by Dept. of Computer applications as a core course, targeting students who wish to pursue research & development in field Cloud Computing & Infrastructure Services. This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS). Course is to introduce the student to cloud computing from architectural and design perspectives. As such the emphasis of the course would be on the underlying infrastructure and architecture of clouds, techniques for enabling services and the quality of such services, as well as issues in designing clouds. Specific research issues in performance, security, and management would also be addressed.

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

[CA 7102.1]. analyses the phases of transition from classic data center to virtual data center and then to the cloud.

[CA 7102.2]. Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.

[CA 7102.3]. Implement the key characteristics, services, and deployment models of cloud.

[CA 7102.4]. Elaborated the cloud infrastructure components and service management processes.

[CA 7102.5]. Illustrate the cloud security concerns and solutions.

[CA 7102.6]. Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment and hence improve employability skills.

## 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

**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 (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 to Clouds and Cloud Computing: Basic Concepts, Cloud Classifications, and Types of Services, deployment models; Classic Data Center (CDC): DBMS concepts, CDC drawbacks and need of Cloud Resources, CDC Management and case studies; Virtualized Data Center (VDC): Compute and Storage, Compute virtualization overview, Compute virtualization techniques, Virtual Machines, VM Resource management techniques, Physical to virtual conversion, Hypervisor Management Software, Virtual Infrastructure Requirements; Storage: Storage virtualization overview, Virtual Machine Storage, Block level and File level virtualization, Virtual provisioning and automated storage tiering; Networking: VDC networking overview, VDC networking components , VLAN and VSAN technologies, Network traffic management, Exercise – VDC networking; Desktop and Application: Desktop virtualization , Application virtualization, Business Continuity in VDC, Fault tolerance mechanism in VDC, Backup in VDC, Replication and migration in VDC, Cloud infrastructure and service creation, Cloud service management; Cloud Security: Security basics, Cloud security concerns and threats, Cloud security mechanisms, Access control and identity management in Cloud, Governance, risk, and compliance, Security best practices for Cloud, Cloud Migration; Issues in Cloud Considerations: Migration Considerations, Security issues at different phases to adopt the Cloud.



**F. Text Books:**

Course materials from EMC<sup>2</sup> Education Services

Miller M, Cloud Computing, 8th Edition, Que Publishers 2008.

Buyya R K, Cloud Computing: Principles and Paradigms, Wiley Press, 2011.

**G. Reference Books:**

K Saurabh, Cloud Computing, 2nd Edition, Wiley India

V Joysula, M Orr, G Page, Cloud Computing: Automating the Virtualized Data Center: Cisco Press, 2012.

Mei- Ling Liu, “ Distributed Computing: Principles and Application”, Pearson Education, Inc. New Delhi. 2004,

## H. Lecture Plan:

Lectures	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Introduction of Cloud	Understand need of Cloud computing	Lecture	7102.1	Mid Term I, Quiz & End Term
2	Cloud Classifications	Learn different cloud types	Flipped Class	7102.1	Mid Term I, Quiz & End Term
3	Types of Services	Analaysis of type of services	Lecture	7102.1	Mid Term I, Quiz & End Term
4	Deployment Models	Learn different models	Activity	7102.1	Mid Term I, Quiz & End Term
5	Classic Data Center (CDC)DBMS concepts, CDC drawbacks and need of Cloud Resources	Learn different type of CDC and DBMS concepts	Lecture	7102.1	Mid Term I, Quiz & End Term
6	CDC Management	Understand the CDC Management	Lecture	7102.1	Mid Term I, Quiz & End Term
7	Case Study- Azure	Analysis Azure Management	Lecture	7102.1 & 7102.2	Mid Term I, Quiz & End Term
8	Case Study-IBM	Analysis IBM Management	Lecture	7102.1 & 7102.2	Mid Term I, Quiz & End Term
9	Case Study-Google	Compare with other cloud management with Google	Lecture	7102.1 & 7102.2	Mid Term I, Quiz & End Term
10	Virtualized Data Center (VDC): Compute	Understand Virtualized Data Center management	Lecture	7102.2	Mid Term I, Quiz & End Term
11	Storage, Compute virtualization overview	Analysis the Storage management of different cloud	Lecture	7102.2	Mid Term I, Quiz & End Term
12	Compute virtualization techniques	Study the different Compute virtualization techniques	Lecture	7102.2	Mid Term I, Quiz & End Term
13	Introduction of Virtual Machines	Learn Virtual Machines	Lecture	7102.2	Mid Term I, Quiz & End Term
14	VM Resource management techniques	Learn different VM Resource management techniques	Lecture	7102.2	Mid Term II, Quiz & End Term
15	VM Resource management techniques	Learn different VM Resource management techniques	Lecture	7102.2	Mid Term II, Quiz & End Term
16	Physical to virtual conversion	Develop the Physical to virtual machine	Flipped Class	7102.2	Mid Term II, Quiz & End Term
17	Hypervisor Management Software	Learn Hypervisor Management Software	Flipped Class	7102.2	Mid Term II, Quiz & End Term
18-19	Virtual Infrastructure Requirements.	Identify Virtual Infrastructure Requirements.	Lecture	7102.2 & 7102.3	Mid Term II, Quiz & End Term

20	Storage: Storage virtualization overview	Learn Storage virtualization	Lecture	7102.2 & 7102.4	Mid Term II, Quiz & End Term
21	Virtual Machine Storage	Application of Virtual Machine Storage	Lecture	7102.2 & 7102.5	Mid Term II, Quiz & End Term
22-23	Block level and File level virtualization	Understand the Block level and File level virtualization	Lecture	7102.2 & 7102.6	Mid Term II, Quiz & End Term
24	Virtual provisioning and automated storage tiering	Understand Virtual provisioning and automated storage tiering	Lecture	7102.2 & 7102.7	Mid Term II, Quiz & End Term
25	VDC networking overview	Learn VDC networking	Lecture	7102.4	Mid Term II, Quiz & End Term
26	VDC networking components	Learn VDC networking components	Lecture	7102.4	Mid Term II, Quiz & End Term
27-28	VLAN and VSAN technologies	Learn VLAN and VSAN technologies	Lecture	7102.4	Mid Term II, Quiz & End Term
29	VLAN and VSAN technologies, Network traffic management	Learn VLAN and VSAN technologies, Network traffic management	Lecture	7102.4	Mid Term II, Quiz & End Term
30	VDC networking, Desktop and Application	VDC networking, Desktop and Application	Lecture	7102.4	Mid Term II, Quiz & End Term
31	Desktop virtualization	Learn Desktop virtualization	Lecture	7102.4	Mid Term II, Quiz & End Term
32	Application virtualization	Learn Application virtualization	Lecture	7102.4	Mid Term II, Quiz & End Term
33	Business Continuity in VDC	Understand Business Continuity in VDC	Lecture	7102.6	Mid Term II, Quiz & End Term
34	Fault tolerance mechanism in VDC	Understand Fault tolerance mechanism in VDC	Lecture	7102.6	Quiz & End Term
35	Backup in VDC	Learn Backup in VDC	Lecture	7102.6	Quiz & End Term
36	Replication and migration	Learn Replication and migration	Lecture	7102.6	Quiz & End Term
37	Cloud service management; Cloud Security	Learn requirement Cloud service management	Lecture	7102.6	Quiz & End Term
38	Security basics	Understand Security Requirement of cloud	Lecture	7102.5	Quiz & End Term
39-40	Cloud security concerns and threats	Understand Cloud security concerns and threats	Lecture	7102.5	Quiz & End Term
41-42	Cloud security mechanisms, Access control and identity management in Cloud	Identify the Cloud security mechanisms	Lecture	7102.5	Quiz & End Term
43-44	Governance, risk, and compliance, Security best practices for Cloud, Cloud Migration	Learn risk and issue in cloud	Lecture	7102.5	Quiz & End Term
45-46	Issues in Cloud Considerations: Migration Considerations	Learn Issues of cloud migration	Lecture	7102.5	Quiz & End Term

47-48	Security issues at different phases to adopt the Cloud	Discuss Security issues in cloud	Lecture	7102.5	<b>Quiz &amp; End Term</b>
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### 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
CS7102.1	Analyses the phases of transition from classic data center to virtual data center and then to the cloud.	3			1				3		
CS7102.2	Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.		3	2						1	1
CS7102.3	Implement the key characteristics, services, and deployment models of cloud.				1	3			2	1	1
CS7102.4	Elaborated the cloud infrastructure components and service management processes.						2		3	1	
CS7102.5	Illustrate the cloud security concerns and solutions.			2				1	1		1
CS7102.6	Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment hence improve employability skills.	2						3	3		1

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

### Question to CO Mapping ETE, 2020

CO	STATEMENT	ETE Q1	ETE Q2	ETE Q3	ETE Q4	ETE Q5
CS7102.1	Analyses the phases of transition from classic data center to virtual data center and then to the cloud.					
CS7102.2	Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.					
CS7102.3	Implement the key characteristics, services, and deployment models of cloud.					
CS7102.4	Elaborated the cloud infrastructure components and service management processes.					
CS7102.5	Illustrate the cloud security concerns and solutions.					
CS7102.6	Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment hence improve employability skills.					

<p align="center"><b>Question to CO Mapping MTT-II, 2020</b></p>
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CO	STATEMENT	MTT1	MTT2	MTT3
CS710 2.1	Analyses the phases of transition from classic data center to virtual data center and then to the cloud.			
CS710 2.2	Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.			
CS710 2.3	Implement the key characteristics, services, and deployment models of cloud.			
CS710 2.4	Elaborated the cloud infrastructure components and service management processes.			
CS710 2.5	Illustrate the cloud security concerns and solutions.			
CS710 2.6	Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment hence improve employability skills.			



# MANIPAL UNIVERSITY JAIPUR

School of Basic Science

Masters of Computer Application

Course Hand-out

Compiler Design | CA 7103 | 3 Credits | 3 1 0 4

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

**Introduction:** Compiler design principles provide an in-depth view of translation and optimization process. Compiler design covers basic translation mechanism and error detection & recovery. It includes lexical, syntax, and semantic analysis as front end, and code generation and optimization as back-end.

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

[7103.1] Understanding of System Software and Phases of Compiler

[7103.2] Understanding of Lexical Analysis and its techniques

[7103.3] Understand Syntax Analysis its techniques

[7103.4] Understanding Intermediate code generator

[7103.5] Understanding final code generator

## 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] To work productively as IT professional both at supportive and leadership roles.

[PSO2] 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.

[PSO3] To build their profession adaptable to the changes in the technology with lifelong learning.

**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**

Compiler Structure: Analysis-Synthesis model of compilation, various phases of a compiler, Tool based approach to compiler construction. A Simple One Pass Compiler: Overview, Syntax Definition, Syntax Directed Translation, Parsing, A Translator for simple expression. Lexical Analysis, Syntax Analysis, Syntax directed definitions: Inherited and Synthesized attributes, dependency graph, evaluation order, Bottom up and top down evaluation of attributes, L- and S- attributed definitions, Intermediate code generation, Intermediate representations, translation of declarations, assignments, control, Flow, Boolean expressions and procedure calls, Code generation and instruction selection: Issues, basic blocks and flow graphs, register allocation, code generation, dag representation of programs, peep hole optimization.

**D. TEXT BOOKS**

1. Wilhelm, Reinhard, Dieter Maurer, and Stephen S. Wilson. *Compiler design*. Reading: Addison-Wesley Publishing Company, 1995.

**E. REFERENCE BOOKS**

1. Grune, Dick, et al. *Modern compiler design*. Springer Science & Business Media, 2012.
2. Srikant, Y. N., and Priti Shankar, eds. *The compiler design handbook: optimizations and machine code generation*. CRC Press, 2018.



**Lecture Plan:**

LEC NO	Major Topic	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Accessing CO
1	Introduction	Understanding CO	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
2		Introduction to System software	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
3		Introduction of Compiler	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
4		Different types of Compiler	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
5		Different types of Compiler	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
6		Phases of Compiler	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
7		Phases of Compiler	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
8		Phases of Compiler	Introduction to Compiler	Lecture	7103 .1	Mid Term I, Quiz & End Term
9	Lexical Analysis	Introduction Lexical Analysis	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term
10		Parsing	Understanding of Lexical Analysis	Flipped Class	7103 .2	Mid Term I, Quiz & End Term
11		Token Patterns, and Lexeme	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term
12		Sentinels	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term
13		Specification of Tokens	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term
14		Regular Expression	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term
15		Transition Diagram	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term

16		Finite Automata	Understanding of Lexical Analysis	Lecture	7103 .2	Mid Term I, Quiz & End Term
17		Regular Expression to Finite Automata	Understanding of Lexical Analysis	Lecture	7103.2	Mid Term I, Quiz & End Term
18	Syntax Analysis	Introduction Syntax Analysis	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term I, Quiz & End Term
19		Role of Parser	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term I, Quiz & End Term
20		Context Free Grammar	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term I, Quiz & End Term
21		Context Free Grammar	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term I, Quiz & End Term
22		Ambiguity	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
23		CFG VS Regular Expression	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
24		Syntax Direct Translator	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
25		Evaluation Order of SDT	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
26		S-Attributed Definitions	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
27		L-Attributed Definitions	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
28		Applications of SDT	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
29		Post fix translation Scheme	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
30		Translation during Recursive Decent Parsing	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
31		L-Attributed SDD's and LL Parsing	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term
32		Bottom-Up Parsing of L-Attributed SDD's	Understanding of Syntax Analysis	Lecture	7103 .3	Mid Term II, Quiz & End Term

33	Intermediate Code Generation	Introduction of Intermediate Code Generation	Understanding of Intermediate Code Generation	Lecture	7103 .4	Mid Term II, Quiz & End Term
34		Variants of Syntax Tree	Understanding of Intermediate Code Generation	Flipped Class	7103 .4	Mid Term II, Quiz & End Term
35		Three Address Code Generation	Understanding of Intermediate Code Generation	Lecture	7103 .4	Mid Term II, Quiz & End Term
36		Three Address Code Generation	Understanding of Intermediate Code Generation	Tutorial	7103 .4	Mid Term II, Quiz & End Term
37		Type Checking	Understanding of Intermediate Code Generation	Tutorial	7103 .4	Mid Term II, Quiz & End Term
38		Control Flow	Understanding of Intermediate Code Generation	Lecture	7103 .4	Mid Term II, Quiz & End Term
39		Back Patching	Understanding of Intermediate Code Generation	Lecture	7103 .4	Mid Term II, Quiz & End Term
40	Final Code Generation	Introduction to Code Generation	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
41		The Target Language	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
42		Basic Blocks	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
43		Flow Graphs	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
44		Flow Graphs	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term

45		Flow Graphs	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
46		Optimization of Basic Blocks	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
47		DAG Reparations	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
48		Dead Code Elimination	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
49		Peep hole Optimization	Understanding of Final Code Generation	Lecture	7103 .5	Mid Term II, Quiz & End Term
50		Tutorial	Tutorial	Tutorial	7103 .5	Mid Term II, Quiz & End Term
51		Tutorial	Tutorial	Tutorial	7103 .5	Mid Term II, Quiz & End Term
52		Tutorial	Tutorial	Tutorial	7103 .5	Mid Term II, 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 7103 .1	Understanding of System Software and Phases of Compiler	3		1	2			2						1		
CA 7103 .2	Understanding of Lexical Analysis and its techniques		2	1		3		1							1	
CA 7103 .3	Understand Syntax Analysis its techniques	1		1	1	2					1			1		
CA 7103 .4	Understanding Intermediate code generator		1		2		1	1								2
CA 7103 .5	Understanding final code generator	1			2			1		1			1			

**1- 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

Cryptography and Network Security| CA 7140| 3 Credits | 3 0 0 3

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

**Introduction:** The course is offered Computer Applications students to understand the principles and practices of Cryptography and Network Security. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and availability. It allows the students to learn that the sensitive information is to be passed through your network safely.

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

- [7140.1] Define the fundamentals of Number Theory used in Cryptography. (Remembering)
- [7140.2] Explain the standard cipher algorithms in transit across data networks. (Understanding)
- [7140.3] Identify Security attacks and select its identification mechanism. (Applying)
- [7140.4] Apply various key distribution and management schemes. (Applying)
- [7140.5] Evaluate authentication mechanisms. (Evaluating)

**B. 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 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

- [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

### 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)	20
End Term Exam (Summative)	End Term Exam (Open 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:

**Elements of Number Theory** : Euclid Algorithm, Prime Number Theorem, Euler's, Fermat's Little theorems, Entropy ; **Classical Cipher Techniques**: Caesar, Affine, Mono-alphabetic, Transposition, Polyalphabetic Ciphers; **Security Attacks**: Active V/S Passive, Security Services; **Symmetric Encryption**: Fiestel Cipher, Confusion and Diffusion, DES Algorithm; **Asymmetric Encryption**: Principles of Public Key Cryptosystems, RSA Algorithm; Message Authentication & Hashing; **Digital Signatures**: RSA Based, El-Gamal Signatures; **Key distribution**; **User Authentication Protocols**; **E-Mail Security**: PGP, S/MIME; **IPsec**: AH & ESP; SSL; TLS; **Intrusion Detection**: Statistical Anomaly Detection, Rule based detection, honeypots; **Password Protection**..

### E. Text / Reference Books:

1. S. Williams, "Cryptography and Network Security: Principles and Practices", Pearson Education, 2008.
2. A. Kahate, "Cryptography and Network Security", Tata Mc-Graw Hill, 2006.
3. K. Charlie, "Network Security: Private Communication in a Public World", Pearson Education, 2008.
4. V. Bagad, I. Dhotre, "Cryptography and Network Security", Technical Publications, 2008.
5. B.A. Forouzan, "Network Security", Tata Mc-Graw Hill, 2007.

**F. Lecture Plan:**

Lec No	Major Topics	Topics	Corresponding CO	Mode of Delivery	Mode of Assessing CO
1.	<b>Elements of Number Theory</b>	Introduction to Number Theory Prime Number Concept Euclid Algorithm	CO1	Lecture	In class Quiz Mid Term I End Term Exam
2.		Fermat's Little Theorem Entropy	CO1	Lecture	In Class Quiz, Mid Term I End Term
3.	<b>Classical Cipher Techniques</b>	Classical Cipher Technique Introduction to Cryptography	CO2	Lecture	In Class Quiz Mid Term I End Term
4.		Substitution Cipher (Mono & Poly Alphabetic)	CO2	Flipped Class	In Class Quiz Mid Term I End Term
5.		Caesar Cipher & Affine Cipher	CO2	Flipped Class	Class Quiz, Mid Term I End Term
6.		Play Fair & Hill Cipher	CO2	Lecture	Class Quiz Mid Term I End Term
7.		Transposition Techniques and Rail Fence Cipher	CO2	Flipped Class	Class Quiz, Mid Term I End Term
8.	<b>Security Attacks</b>	Security Attack Active & Passive Attack	CO3	Lecture	Class Quiz Mid Term I End Term
9.		Security Services (ITU-T X.800) Introduction to Encryption Techniques, Stream Cipher and Block Cipher	CO3	Lecture	Class Quiz, Mid Term I End Term
10.		Symmetric Encryption Feistel Cipher	CO2	Tutorial	Class Quiz Mid Term II End Term
11.		Confusion and Diffusion	CO2, CO4	Lecture	Class Quiz Mid Term II End Term



12.	<b>Symmetric Encryption</b>	DES Algorithm, Analysis of DES Algorithm	CO2, CO4	Lecture	Class Quiz Mid Term II End Term
13.		AES Algorithm	CO3, CO4	Lecture	Class Quiz Mid Term II End Term
14.		Modes of Operation (Block)	CO4	Lecture	Class Quiz Mid Term II End Term
15.	<b>Asymmetric Encryption</b>	Asymmetric Encryption, Public Key Cryptosystem	CO4	Lecture	Class Quiz Mid Term II End Term
16.		RSA Algorithm	CO4	Lecture	Class Quiz Mid Term II End Term
17.		Security Analysis of RSA Algorithm	CO4	Flipped Class	Class Quiz Mid Term II End Term
18.		ElGamal Cryptosystem & Security Analysis	CO3, CO4	Lecture	Class Quiz Mid Term II End Term
19.		Introduction to MAC, HMAC & CMAC, Introduction to Hashing, Properties of Hash (Aniruddh)	CO4	Lecture	Class Quiz Mid Term II End Term
20.		MD-5, SHA-1	CO2, CO4	Lecture	Class Quiz Mid Term II End Term
21.		SHA-128, SHA-2	CO2, CO4	Lecture	Class Quiz Mid Term II End Term
22.	<b>Digital Signatures</b>	Digital Signature Scheme	CO5	Lecture	Class Quiz Mid Term II End Term
23.		RSA Based	CO5	Lecture	Class Quiz Mid Term II End Term

24.		EL-Gamal	CO4, CO5	Lecture	Class Quiz Mid Term II End Term
25.		Problem of Key Sharing & Diffie Hellman	CO4, CO5	Lecture	Class Quiz Mid Term II End Term
26.	<b>User Authentication Protocols</b>	Key Distribution Scheme, Symmetric Key Distribution	CO4, CO5	Lecture	Class Quiz Mid Term II End Term
27.		Kerberos Authentication	CO5	Lecture	Class Quiz Mid Term II End Term
28.		Symmetric Key Agreement, Public Key Distribution	CO4, CO5	Lecture	Class Quiz Mid Term II End Term
29.		User Authentication Protocols	CO5	Flipped Class	Class Quiz End Term
30.	<b>IP Sec</b>	IP Security Introduction (Anand)	CO5	Tutorial	Class Quiz End Term
31.		AH & ESP Schemes (Anand)	CO5	Tutorial	Class Quiz End Term
32.		Introduction to SSL, Open SSL (Paridhi)	CO5	Lecture	Class Quiz End Term
33.		Transport Layer Security (Shobhit)	CO2, CO5	Lecture	Class Quiz End Term
34.	<b>Intrusion Detection</b>	Intrusion: Introduction (Himanshu)	CO3, CO5	Tutorial	Class Quiz End Term
35.		Statistical Anomaly Detection, Rule Based Detection (Shubham)	CO3, CO5	Tutorial	Class Quiz End Term
36.		Honeypots (Nitish)	CO3, CO5	Flipped Class	Class Quiz End Term
37.		Password Protection, Password Protection Schemes & Policies (Sawan)	CO3, CO5	Lecture	Class Quiz End Term

		(Ritika)			
38.		Firewalls: Definition & Construction (Kamakshi)	CO3, CO5	Lecture	End Term
39.		Working Principle of Firewalls (Kuldeep)	CO3, CO5	Lecture	End Term

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

CO	STATEMENT	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
7140.1	Define the fundamentals of Number Theory used in Cryptography.	3	2	1	1		1		1	1	1
7140.2	Explain the standard cipher algorithms in transit across data networks.	2		2	1	1	1		1	1	1
7140.3	Identify Security attacks and select its identification mechanism.	2		1	1		1		1	1	1
7140.4	Apply various key distribution and management schemes.	2		2	1	1	1		1	1	1
7140.5	Evaluate authentication mechanisms.	2		2	1		1		1	1	1

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

**Question to CO Mapping ETE, 2018**

<b>CO</b>	<b>STATEMENT</b>	<b>ETE Q1</b>	<b>ETE Q2</b>	<b>ETE Q3</b>	<b>ETE Q4</b>	<b>ETE Q5</b>
7140.1	Define the fundamentals of Number Theory used in Cryptography.					
7140.2	Explain the standard cipher algorithms in transit across data networks.					
7140.3	Identify Security attacks and select its identification mechanism.					
7140.4	Apply various key distribution and management schemes.					
7140.5	Evaluate authentication mechanisms.					

**Question to CO Mapping MTT-II, 2018**

<b>CO</b>	<b>STATEMENT</b>	<b>MTT1</b>	<b>MTT2</b>	<b>MTT3</b>
7140.1	Define the fundamentals of Number Theory used in Cryptography.			
7140.2	Explain the standard cipher algorithms in transit across data networks.			
7140.3	Identify Security attacks and select its identification mechanism.			
7140.4	Apply various key distribution and management schemes.			
7140.5	Evaluate authentication mechanisms.			

### Question to CO Mapping MTT-I, 2018

CO	STATEMENT	ETE Q1	ETE Q2	ETE Q3
7140.1	Define the fundamentals of Number Theory used in Cryptography.			
7140.2	Explain the standard cipher algorithms in transit across data networks.			
7140.3	Identify Security attacks and select its identification mechanism.			
7140.4	Apply various key distribution and management schemes.			
7140.5	Evaluate authentication mechanisms.			



**SCHOOL OF BASIC SCIENCE**

**DEPARTMENT OF COMPUTER APPLICATIONS**

**COURSE HAND-OUT**

Machine Learning | CA 7145 | 3 Credits | 3 0 0 3

Session: Aug20 – Nov 20 | Faculty: Dr. Shilpa Kulkarni Sharma | Class: MCA III

**A. Introduction:** This course provides a The primary purpose of machine learning is to discover patterns in the user data and then make predictions based on these and intricate patterns for answering business questions and solving business problems. Machine learning helps in analyzing the data as well as identifying trends.

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

[7145.1]. To introduce the basic concepts and techniques of Machine Learning for solving practical problems.

[7145.2]. To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.

[7145.3]. To be able to use regularized regression, classification and clustering algorithms.

[7145.4]. To understand the concept behind neural networks for learning non-linear functions in order to recognize the deep learning and reinforcement learning algorithms

**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
	Sessional Exam I (Close Book)	20

Internal Assessment (Summative)	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

Machine Learning: Definition, Scope, Advantages of Machine Learning, Applications of Machine Learning, Tools of Machine Learning Modelling, Testing and Training of Model, Statistical Techniques: Regression, Classification, Clustering, Probability Theories, Decision Trees, Categories of Machine Learning: Supervised Learning, Unsupervised, Reinforcement, Deep learning, Deep Reinforcement. k-Nearest Neighbors, Naive Bayes, Logistic Regression, Support Vector Machines, k-means clustering, Artificial Neural Network.

## E. TEXTBOOK:

1. Oliver Theobald, Machine Learning for Absolute Beginners: A Plain English Introduction, Scatterplot Press, 2nd Edition, 2017

## F. REFERENCES:

1. Dhaval Maheta, Machine Learning with R - Rattle Package, LAP LAMBERT Academic Publishing, 2019.
2. Sebastian Raschka & Vahid Mirjalili, "Python Machine Learning", Ingram short title, 2nd Revised edition, 2017.

## G. Lecture Plan:

Lectures	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1-2	<b>Machine Learning</b>	Definition, Scope, Advantages of Machine Learning, Applications of Machine Learning	To introduce students to the basic concepts and techniques of Machine Learning.	Lecture	CA 7145 .1	Mid Term I, Assignment/ Quiz
3-4		Tools of Machine Learning Modelling		Lecture	CA 7145 .1	Mid Term I, Assignment/ Quiz
5-6.		Testing and Training of Model		Lecture	CA 7145 .1	Mid Term I, Assignment/ Quiz

7	<b>Categories of Machine Learning</b>	Supervised Learning		Lecture	CA 7145 .2	Mid Term I, Assignment/ Quiz
8		Unsupervised Learning		Lecture	CA 7145 .2	Mid Term I, Assignment/ Quiz
9		Reinforcement Learning		Lecture	CA 7145 .2	Mid Term I, Assignment/ Quiz
10-12	<b>Statistical Techniques</b>	Regression	To become familiar with regression methods	Lecture and Practice	CA 7145 .3	Mid Term I, Assignment/ Quiz
13-14		Logistic Regression		Lecture and Practice	CA 7145 .3	Mid Term I, Assignment/ Quiz
15-17	<b>Classification</b>	Probability Theories, Decision Trees	To become familiar with classification methods	Lecture and Practice	CA 7145 .3	Mid Term II, Assignment/ Quiz
18-20		Random Forest		Lecture and Practice	CA 7145 .3	Mid Term II, Assignment/ Quiz
21-22		Naïve Bayes		Lecture and Practice	CA 7145 .3	Mid Term II, Assignment/ Quiz
23-25		k-Nearest Neighbours		Lecture and Practice	CA 7145 .3	Mid Term II, Assignment/ Quiz
26-28		Support Vector Machine		Lecture and Practice	CA 7145 .3	Mid Term II, Assignment/ Quiz
29-31	<b>Clustering</b>	k-means clustering	To become familiar with clustering methods	Lecture and Practice	CA 7145 .3	End Term
32-34	<b>Deep learning</b>	Deep learning	To upgrade the ML concepts with the idea of Deep learning and NN	Lecture	CA 7145 .4	End Term
35-37		Artificial Neural Network		Lecture	CA 7145 .4	End Term
38		Reinforcement Learning		Lecture	CA 7145 .4	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	PSO 1	PSO 2	PSO 3
CA 7145.1	To introduce the basic concepts and techniques of Machine Learning for solving practical problems.	1	1	1	2	1	3	1	1	3	1
CA 7145.2	To characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.	1		1	3	1	2	1	1	3	1
CA 7145.3	To be able to use regularized regression, classification and clustering algorithms.	2		3	3	1	1		2	1	2
CA 7145.4	To understand the concept behind neural networks for learning non-linear functions in order to recognize the deep learning and reinforcement learning algorithms	2	1		3	1			2	1	1

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