ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)
BOARD OF STUDIES – MARCH 2021
MCA DEPARTMENT

MEMBERS PRESENT

1. Mrs. A. Josephine Anitha	Head & Asso.Prof, MCA Department, Ethiraj College for Women, Chennai – 8.	**Chairperson**
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3. Dr. Mary Vennila	Head, PG and Research Department of Computer Science, Presidency College, Chennai.	**Subject Expert**
4. Dr. P. Balakrishnan	Asso. Prof, School of Computer Science and Engineering, VIT, Vellore.	**Subject Expert**
5. Mr. Vinod Sendhil. T	Managing Director & Chief Technical Officer, InfySec, Kolathur. Chennai - 80.	**External Expert (Industry)**
5. Mrs. R. Devikala	Asst. Prof, MCA Department, Ethiraj College for Women, Chennai.	**Senior Staff**
6. Dr. Shantha Visalakshi. U	Asst. Prof, MCA Department, Ethiraj College for Women, Chennai.	**Senior Staff**
7. Ms. Aswini.C	Alumini, (2018 – 2020) Batch.	**Student Representative**

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)
MCA DEPARTMENT

MINUTES OF THE BOARD OF STUDIES – MAR 2021

As per UGC and AICTE guidelines, MCA course has been restructured to be a two-year, full-time postgraduate course instead of the existing three-year postgraduate degree course from the academic year (2020-2021). The board of studies for the MCA programme met on **10th Mar 2021 at 10.15 a.m** in the MCA Department, I floor, Campus II to finalize the new proposed MCA curriculum, question paper template, evaluation pattern and approve the external examiners and question paper setter for two year MCA Program from the academic year (2020-2021) in accordance with the guidelines prescribed by the Ethiraj College for Women (Autonomous).

The following suggestions were passed by the board members present.

1. The Board approves the Bridge Course and the courses included are Basics of Programming, Problem Solving Techniques, Mathematical Foundation of Computer Science and Coding and Debugging Skills. The Bridge course to be carried out for 2 weeks – 30 hours duration and completed before the commencement of the regular classes.
2. The Board scrutinized the syllabi for two year full time MCA program to finalize the various courses in the format given for the implementation from the academic year (2020-2021). The total prescribed credits under each category for each course were scrutinized.
3. The Board also scrutinized the question paper setters and external examiners for each course, question paper pattern and the evaluation pattern of the various courses. The details of the syllabi are given below.
4. It has been recommended to have a **value added course** and the course suggested was: **Cyber Awareness for Women.**
5. The board highly appreciated the evaluation pattern and split-up scheme adopted for all the laboratory courses, internship and Major Project.
6. For major project viva-voce, the end semester mark is reduced to 100 from 200 and the credits remain the same as 15.

The following were the recommendations suggested:

i. The value added course **Cyber Awareness for Women** has been included in the second semester and the credit for the course is 2.

The course contents organized as follows.

COURSES INCLUDED IN THE SYLLABUS

- In **Sem – I**, the course **"Python Programming"** with corresponding practical is included.
- In **Sem – I**, the course "**Digital Computer Fundamentals"** is included.
- In **Sem – I**, the course "**Database Management Systems"** with corresponding practical is included.
- In **Sem - I**, three fundamental courses namely **Software Engineering, Computer Networks and Operating Systems** have been added as elective courses.
- In **Sem – I**, an extra disciplinary course "**Accounting and Financial Management"** is included.
- In **Sem – I**, a new soft-skill course, **"Human Values and Professional Ethics"** introduced.
- In **Sem – II**, the course "**Advanced Java Programming"** with corresponding practical is included.
- In **Sem – II**, the course "**Cryptography and Network Security"** is included.
- In **Sem – II**, the course **"Software Testing"** with corresponding practical is included.
- In **Sem - II**, three emerging technologies namely **Mobile Computing, Cloud Computing and Internet of Things** have been added as elective courses.
- In **Sem – II**, an extra disciplinary course **"Statistical Methods"** is included to cope-up with the needs of further level research oriented studies.
- In **Sem – II,** the practical courses included are **Advanced Java Programming and Software Testing**
- In **Sem – II**, the soft-skill course, **"Technical Seminar and Report Writing"** has been included to meet out the future need of research oriented higher studies.
- In SEm – II, the value added course, **Cyber Awareness for Women** is included.
- In **Sem – III**, the course "**XML and Web Services"**with corresponding laboratory paper is included.
- In **Sem – III**, the course "**Soft Computing"** is included.
- In **Sem – III**, the course "**Machine Learning"** with corresponding practical is included.
- In **Sem - III**, three emerging technologies namely **Artificial Intelligence, Digital Image Processing & Virtual and Augmented Reality** have been included as elective courses.

- In **Sem - III**, three emerging technologies namely **Robotics, Big Data Analytics and Data warehousing and Mining** have been added as elective courses.
- In **Sem – III**, the course "**Soft Computing"** has been included.
- In **Sem – III**, Soft skill paper "**Quantitative Aptitude and Interview Skills**" is introduced to improve the employability skills of the students
- In **Sem – III**, laboratory paper "**Mini Project**" is included.
- In semester II "**Internship**" is included to have the mock work experience in the leading MNCs, Public and Private Sectors which will be carried out during the summer vacation of first year and evaluation will be carried out in the beginning of III semester.
- In **Sem – IV**, Soft skill paper "**Entrepreneurial Skills**" is introduced as a new paper to improve the employability skills of the students.
- In **Sem – IV**, laboratory paper "**Major Project & Viva voce**" is included.
- For all the Part IV soft skill courses and value added course only internal valuation will be carried out for 100 marks.
- The templates for both Continuous Assessment and End-Sem Question Papers are approved.

CONTINUOUS ASSESSMENT QUESTION PAPER TEMPLATE

(Part – A contains FIVE two mark questions **(5 x2 = 10 marks))**

(Part – B contains TWO out of THREE must be answered **(2 x 5=10 marks))**

(Part –C contains TWO questions of internal choice **(2 x 10=20 marks))**

END-SEM QUESTION PAPER TEMPLATE

(Part – A contains TEN two mark questions **(10 x2 = 20 marks))**

(Part – B contains SEVEN out of FIVE must be answered **(5 x 6=30 marks))**

(Part –C contains FIVE questions of internal choice **(5 x 10=50 marks))**

The following suggestion was made in the major project viva-voce

For major project viva-voce, the end semester mark is reduced to 100 from 200 and the credits remain the same as 15.

And the evaluation pattern is

10.3.2 DISTRIBUTION OF MARKS IN THE EVALUATION OF MAJOR PROJECT AND VIVA VOCE

Dissertation	**Internal**	**External**
Problem for study	4 Marks	8 Marks
Knowledge in the System Requirement Specification	4 Marks	8 Marks
Development of Extra skill in the chosen software	4 Marks	8 Marks
Scientific writing capability	4 Marks	8 Marks
Implementation of the developed System	4 Marks	8 Marks
TOTAL	**20 Marks**	**40 Marks**

Viva-voce	**Internal**	**External**
Preparation of the Presentation (OHP/LCD etc.,)	10 Marks	10 Marks
Defense capability in oral examination	10 Marks	10 Marks
TOTAL	**20 Marks**	**20 Marks**

Total Internal Marks: 40; Total External Marks: 60;

Final Marks: Internal +External Marks.

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Regulations and Syllabi

Of

Master of Computer Applications

(Self- Supporting)

Offered from the academic year 2020-2021

MCA DEPARTMENT

ETHIRAJCOLLEGE FOR WOMEN
(AUTONOMOUS)

Re-Accredited with 'A' Grade Status by NAAC
College with Potential for Excellence by the UGC

(Effective from the academic year 2020-2021)

OBJECTIVES OF THE MASTER'S PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

MCA Programme will produce post graduates who will be able to:

PEO 1: Professional Upgradation
Graduates will have successful academic career growth to excel in the IT profession by offering concrete technical foundations in the field of computer applications.
PEO 2: Research & Innovation
Graduates will have the cognitive ability to choose the research domain to pursue lifelong learning.
PEO 3: Managerial Skills
Graduate will have employment in public and private sectors and resolve economic, social and environmental needs.
PEO 4: Communication Efficacy:
To prepare the students to communicate, coordinate and function in an efficient manner as an individual and as a team member.

1. ELIGIBILITY FOR ADMISSION

A pass in BCA/ Bachelor Degree in Computer Science Engineering or equivalent Degree OR a pass in B.Sc./ B.Com./ B.A. with Mathematics at 10+2 level or at Graduation Level **(with additional bridge Courses as per the norms of the concerned University)** and obtained at least 50% marks (45% marks in case of candidates belonging to reserved category) in the qualifying Examination.

(a) 10 + 2 + 3/4/5 years pattern (or)
(b) 10 + 3 years Diploma* + 3 years pattern (or)
(c) (i) 10 + 2 + AMIE** (or)
(ii) 10 + 3 Years Diploma* + AMIE**

CANDIDATES SHOULD HAVE APPEARED FOR TANCET.

2. DURATION OF THE COURSE

The course duration shall be two years consisting of four semesters. In order to be eligible for the award of the degree the candidate shall successfully complete the course in a maximum period of five years reckoned from the date of enrolment for the first semester of the course.

3. ELIGIBILITY FOR THE AWARD OF DEGREE

A candidate shall be eligible for the award of the Degree of Master of Computer Applications only if she has undergone the prescribed courses of study in the MCA Department, Ethiraj College for Women (Autonomous) affiliated to the University of Madras for a period of two academic years and passed the examinations of all the foursemesters and fulfilled the prescribed conditions stated above.

4. PASSING MINIMUM

A minimum of **50%** marks taken as an aggregate of CIA and EE of the course is prescribed for a **PASS**. A candidate who has not secured a minimum of **50%** of the maximum marks**(aggregate of CIA: 40 and EE: 60)** in a course shall be deemed to have failed in that course. A candidate who successfully completes the course and passes the examinations of all the four semesters prescribed as per the syllabus earning a minimum of **97**credits shall be declared to have qualified for the degree, provided the whole course has been completed within a maximum period as prescribed and permissible by the College.

PROGRAMME OUTCOMES (PO)

The post graduates are able to:

PO1: **Computational Knowledge:** Acquire in-depth insight into the recent technologies and integrate with existing knowledge thereby stimulating thrust to think 'out of the box' in wider and global perspective.

PO2: **ProblemAnalysis:** Analyze and design Information and Communication Technology applications to build solutions for real-time problems and necessities.

PO3: **Conduct Investigation of Complex problems:** Find the probability of optimal utilization of the developed product and the feasible study over the size and scope of the future demand.

PO4: **Design and Development:** Design and develop a solution for recent research trends and real-time problems.

PO5: **Modern ToolsUsage:** Create/Select the appropriate recent research trend tools to demonstrate or to simulate the technical test beds for the better clarity to reach out the further move towards academic excellence.

PO6: Communication: Communicate effectively on ICT activities with the academic community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, give and receive instructions with at most clarity.

PO7: Individual and Teamwork: Cultivate and impart the skills to work as an individual and as a team in proposing solutions to cater the business and research requirements.

PO8:Life-long learning: Incline for independent life-long learning.

PO9:Creativity and Entrepreneurship: Search for opportunities in the field of Entrepreneurship to create and add value for the progress of an individual and society.

PO10: Social Responsibility: Knowing the risks and threats involved in the cyber access and deriving the possible precautionary and preventing measures.

PROGRAMME SPECIFIC OUTCOMES (PSO)

After completing the course, the post graduate students will be able to,

PSO1: Accomplish both technical and non-technical skills in developing algorithms and implement them in high level languages to deploy and promote them for innovative software solutions

PSO2: Excel in managerial and leadership skills and recognize the need of lifelong learning to adapt themselves with ease to new technologies

PSO3: Analyze real life problems, design computing solutions appropriately that are technically sound, economically feasible and socially acceptable

PSO4: Develop professional ethics in utilizing modern computer technologies, environments, and platforms in creating innovative career paths towards the technological growth

PSO5: Impart strong technical foundation to the students in pursuing research thereby contributing technical upgradationsto the society.

5. CLASSIFICATION AND RANKING OF SUCCESSFUL CANDIDATES

a. Successful candidates securing not less than **75%**in the aggregate of the marks prescribed for the course shall be declared to have qualified for the Degree in **First Class with Distinction** provided they pass all the examinations prescribed for the course as well as the project work in the First appearance.

b. Successful candidates securing not less than **60%** in the aggregate of the marks prescribed for the course shall be declared to have qualified for the Degree in **First Class.**

c. All other successful candidates shall declare to have passed the examination in the **Second Class**.

d. Only those candidates who have passed all the papers including practical and project work in the first appearance shall be considered for the purpose of **RANKING.**

6. COMPONENTS OF THE MASTERS PROGRAMME

The Master's Programme has three components. They are Core Courses, Elective Courses, Extra Disciplinary Courses, Soft Skill Courses, Self Study Course, & Value Added Course. Each course carries a credit depending upon the content. Students have to earn **97**credits comprising of Core, Elective, Extra Disciplinary, Value Added and Soft Skill Courses.

S.NO	Course	Credits
1	Core: Theory Practical	**4** **2**
2	Elective and Extra Disciplinary Course	**3**
3	Internship Mini Project	**2** **2**
4	Major Project and Viva-voce	**15**
5	Soft Skill Course	**2**
6	Bridge Course	**-**
8	Value Added Course	**2**

BRIDGE COURSE

BRIDGE COURSE

The main objective of the course is to bridge the gap between subjects studied at UG level and subjects they would be studying in MCA course. A bridge course for newly admitted non computer science major students is conducted for the period of two weeks prior to the commencement of the first semester. The course is designed to kick-start the students' skills and to get them equipped for the competitive environment.

The bridge courses offered byMCA Department are provided for non-computer science studentswho are lacking a background in computer science, so that they can be well prepared and have adequate knowledge to handle the courses offered. The bridge course exactly focused on these:Basics of Programming, Problem Solving, Mathematical Foundations of Computer Science, Information Technology and Coding and Debugging skills. Students will develop competencies in the above said areas.

Course Code	Course Title	Total Hours
MCA20/BC1/BPG	Basics of Programming	**6**
MCA20/BC2/PST	Problem Solving Techniques	**6**
MCA20/BC3/MFC	Mathematical Foundations of Computer Science	**6**
MCA20/BC4/CDS	Coding & Debugging Skills	**6**
	Test & Evaluation	**6**
	Total	**30**

MCA Department is offering need based bridge courses and foundation courses to meet pre-requisite requirements and academic needs based on the qualifications of the students admitted. The mentoring team of the department shallrecommend carrying out the bridge and foundation courses as mandatory courses for that candidate.Nurturing and evaluation process of bridge and foundation courses is left to the respective department.

Quizzes will be conducted in between the classes. Learner engagement is essential throughout the period of the class. The aptitude test at the end of the Bridge course is designed for student profiling. A detailed profile of Strength, Weakness, Opportunities and Challenges for individual students will be given to each student. This helps the student in understanding where they stand and what next to be done.

BRIDGE COURSEI :BASICS OF PROGRAMMING

PAPER NO: BC1 **CODE : MCA20/BC1/BPG**
Teaching Hours: 5Hrs **L T P C :6 0 0 0**

UNIT I: Fundamentals of C Programming**:** Introduction to Problem Solving – Basic Programs, Flowcharts - Pseudo codes – Algorithms - Syntax and Semantic errors - Variables and Data Type - Arithmetic expressions - Relational Operations - Logical expressions – Branching - Loops.

UNIT II: Arrays, 2D Arrays - Character Arrays - Strings - Functions and passing by value-Passing Arrays to Functions-Call by Reference- Recursion- Structures- Pointers- Files.

UNIT III: Object Oriented Programming using **C++:** Overview -Oriented features - Classes and basic Objects - Inheritance- Overloading – Polymorphism- Static and Dynamic Binding.

UNIT IV: Type Casting- C++Exceptions- Standard Exception classes- Templates & STL-Functions and class Templates using STL.

UNIT V: Java Programming**:** JAVA Features- Input and Output Handling in Java-Classes-Objects- Method overloading – Inheritance-Interfaces- Exception Handling – Multi threaded Programming-Applets -Java Swing and AWT.

BRIDGE COURSEII : PROBLEM SOLVING TECHNIQUES

PAPER NO: BC2 **CODE : MCA20/BC2/PST**

Teaching Hours: 15 x 2 = 30 HrsL T P C :6 0 0 0

UNIT I: Introduction to Problem Solving: Overview of Problems – Definition - Identify the problem - Define the problem through thinking about it and sorting out the relevant information - Types of Problems.

UNIT II: Recognizing Problems: Categories of Problem Solving - Organizing information and using modeling techniques - Explore solutions through looking at alternatives, brainstorming andchecking out different points of view - Act on the strategies - Look back and evaluate the effects.

UNIT III: Decision making methods: Decision methods – Consensus and Ethical decisions – Group Decision making - Decision making and Problem Solving in organizations.

UNIT IV: Data Visualization: Charts and Diagrams – Data Collection – Data analysis - Pareto Chart – Cause and Effect – Histograms - Control charts -Analyzing data - recognizing trends - making decisions and recommendations.

UNIT V: Implementing Decisions: Basic decisions on information — Implementing Decision Results - Being flexible and thinking creatively - Generalizing and consolidating – Providing recommendations and business strategies.

BRIDGE COURSEIII: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

PAPER NO: BC3 **CODE : MCA20/BC3/MFC**
Teaching Hours: 5 HrsL T P C:6 0 0 0

UNIT I : Mathematical Logic**:** Introduction - Statements and Notation - Connectives - The Predicate Calculus: Definition- Predicate Formulas. 8 Hrs

UNIT II : Set And Graph Theory**:** Basic Concepts of Set Theory – Operations on Sets – Venn Diagrams .

UNIT III : Algebraic Structures**:** Algebraic Systems – Semigroups - Monoids, Homomorphism of Semigroups and Monoids

UNIT IV : Fundamentals Of Statistics **:**Classification And Tabulation of Data: Types of Classification – Types of Tables–Measures of Central Value – Arithmetic Mean, Median,Mode.

UNIT V : Probability**:** Calculation of Probability – Theorems of Probability theorem – Conditional Probability – Bayes' Theorem. (Statements only)

BOOKS AND REFERENCES:

1. J.P.Tremblay, R.Manohar, Discrete Mathematical Structures with applications to Computer Science, TM Hall Edition , 2008.
2. S.P.Gupta , Statistical Methods ,Sultan Chand & Sons, 2011.
3. D.C.Sancheti , V. K . Kapoor ,Statistics (Theory , Methods and Applications),Sultan Chand &Sons , 2011 .

E-LEARNING RESOURCES:

http://nptel.ac.in/courses/106106094/
http://nptel.ac.in/courses/111107058/
http://nptel.ac.in/courses/111101004/
http://nptel.ac.in/courses/111105090/

BRIDGE COURSEIV: CODING & DEBUGGING SKILLS

PAPER NO: BC4 **CODE : MCA20/BC4/CDS**
Teaching Hours: 15 x 2 = 30 Hrs **L T P C : 0 0 6 0**

PRACTICE PROGRAMS:

Practice programs from programming languages C, C++ and Java can be given based on the needs of the students

COURSE PROFILE

Course Code	Course Title	Hrs/ Wk	Credit	CA	End Sem	Total
SEMESTER I						
MCA20/1C/PPG	Python Programming	4	4	40	60	100
MCA20/1C/DCF	Digital Computer Fundamentals	4	4	40	60	100
MCA20/1C/DMS	Database Management Systems	4	4	40	60	100
MCA20/1E1/SEG MCA20/1E1/CNS MCA20/1E1/OSS	Software Engineering Computer Networks Operating Systems	3	3	40	60	100
MCA20/1P1/PPG	Computer Laboratory – I:Python Programming	5	2	40	60	100
MCA20/1P2/DMS	Computer Laboratory –II: Database Management Systems	5	2	40	60	100
MCA20/1ED1/AFM	Accounting and Financial Management	3	3	40	60	100
MCA20/1S1/HVP	Human Values and Professional Ethics	3	2	-	-	100
		Total	**24**			
SEMESTER II						
MCA20/2C/AJP	Advanced Java Programming	4	4	40	60	100
MCA20/2C/CNS	Cryptography and Network Security	4	4	40	60	100
MCA20/2C/STG	Software Testing	4	4	40	60	100
MCA20/2E2/MCG MCA20/2E2/CCG MCA20/2E2/IOT	Mobile Computing Cloud Computing Internet Of Things	3	3	40	60	100
MCA20/2P3/AJP	Computer Laboratory – III: Advanced Java Programming	5	2	40	60	100
MCA20/2P4/STG	Computer Laboratory – IV: Software Testing	5	2	40	60	100
MCA20/2ED2/SMS	Statistical Methods	3	3	40	60	100
MCA20/2VAC/CAW	Cyber Awareness for Women	3	2			100
MCA20/2S2/BCNA MCA20/2S2/BCNB MCA20/2S2/BCNC	Business Communication - Preliminary Business Communication - Vantage Business Communication – Higher	3	2	-	-	100
MCA20/2S3/TSR	Technical Seminar and Report Writing	3	2	-	-	100
Internship	During I Year Summer Vacation 6 to 8 weeks –	-	-	-	-	-

	Evaluation will be at the beginning of the third Semester					
		Total	**28**			
SEMESTER III						
MCA20/3C/XWS	XML and Web Services	4	4	40	60	100
MCA20/3C/MLG	Machine Learning	4	4	40	60	100
MCA20/3C/SCG	Soft Computing	4	4	40	60	100
MCA20/3E3/AIE MCA20/3E3/DIP MCA20/3E3/VAR	Artificial Intelligence Digital Image Processing Virtual and Augmented Reality	3	3	40	60	100
MCA20/3E4/RTS MCA20/3E4/BDA MCA20/3E4/DWM	Robotics Big Data Analytics Data Warehousing and Mining	3	3	40	60	100
MCA20/3P5/XWS	Computer Laboratory -V: XML and Web Services	5	2	40	60	100
MCA20/3P6/MLG	Computer Laboratory -VI: Machine Learning	5	2	40	60	100
MCA20/3P7/MPT	Computer Laboratory - VII: Mini Project	5	2	40	60	100
MCA20/3P8/INP	Computer Laboratory VIII-Internship	-	2	-	-	100
MCA20/3S4/QAI	Quantitative Aptitude & Interview Skills	3	2	-	-	100
		Total	**28**			
SEMESTER IV						
MCA20/4S5/ESD	Entrepreneurial Skill Development	3	2	-	-	100
MCA20/4P9/MPV	Computer Laboratory - IX: Major Project & viva-voce	-	15	40	60	100
		Total	**17**			

Internship has to be carried out during summer vacation for the period of 6 to 8 weeks and will be evaluated in the subsequent semester.

ELECTIVE COURSES:

Elective I:

MCA20/1E1/SEG	Software Engineering
MCA20/1E1/CNS	Computer Networks
MCA20/1E1/OSS	Operating Systems

Elective II:

MCA20/2E2/MCG	Mobile Computing
MCA20/2E2/CCG	Cloud Computing
MCA20/2E2/IOT	Internet Of Things

Elective III:

MCA20/3E3/AIE	Artificial Intelligence
MCA20/3E3/DIP	Digital Image Processing
MCA20/3E3/VAR	Virtual and Augmented Reality

Elective IV:

MCA20/3E4/RTS MCA20/3E4/BDA MCA20/3E4/DWM	Robotics Big Data Analytics Data Warehousing and Mining

EXTRA DISCIPLINARY COURSES

MCA20/1ED1/AFM	Accounting and Financial Management
MCA20/2ED2/SMS	Statistical Methods

SOFT SKILL/ COMMUNICATION SKILL COURSES

MCA20/1S1/HVP	Human Values and Professional Ethics
MCA20/2S2/BEC	Business English Communication
MCA20/2S3/TSR	Technical Seminar and Report Writing
MCA20/3S4/QAI	Quantitative Aptitude & Interview Skills
MCA20/4S5/ESD	Entrepreneurial Skill Development

VALUE ADDED COURSE

Students are encouraged to pursue value added courses to earn extra 2 credits to have the self-awareness about various social mediacrimes exclusive to women.

MCA20/2VA1/CAW	Cyber Awareness for Women

10. EXAMINATION AND EVALUATION

10.1. Evaluation pattern of both Theory and Laboratory courses

Evaluation shall be done on a continuous basis. There shall be **two Tests fortwohours**duration(Continuous Internal Assessment Test) and **one ExternalExamination for three hours** duration in each course during each semester. Continuous Assessment will be evaluated by one or more participatory tools such as Test, Assignment/Seminar, Participation Learning and Laboratory activities etc., whichever would be suitable to the course.

Distribution of marks in CIA for Theory Courses:

Test	Duration	Max.Marks	CA Final Marks
I	2 Hours	40	10
II	2 Hours	40	10
		Assignment	10
		Seminar / Participatory Learning	10

Total	40

Distribution of marks in CIAfor Practical Courses:

Test	Duration	Max.Marks	CA Final Marks
I	2 Hours	40	10
II	2 Hours	40	10
		Model Exam	10
		Record	5
		Lab Activities	5
		Total	40

DISTRIBUTION OF MARKS TO CIA AND EE:

I. THEORY COURSES/ELECTIVE COURSES/EXTRA DISCIPLINARY COURSES

Maximum Marks (CIA + EE) : 100 Marks
Continuous Internal Assessment(CIA) : 40 Marks
External Evaluation (EE) :100 Marks (to be converted to 60)

II. COMPUTER LABORATORY EXAMINATION

Duration : 3 Hrs
Maximum for Lab Course : 60 Marks
Continuous Internal Assessment(CIA) : 40 Marks
Passing Minimum in CIA : 20 Marks
External Examination* : 60 Marks
***Double valuation by Internal and External Examiner**
Final Marks: Internal + ExternalMarks : 100 Marks

III. MINI PROJECT AND INTERNSHIP

Continuous Internal Assessment(CIA) : 40 Marks
External Examination :60 Marks
Final Marks: Internal + ExternalMarks : 100 Marks

IV. MAJOR PROJECT

Maximum Marks (CIA+EE) : 100 Marks
Continuous Internal Assessment(CIA) : 40 Marks
External Examination : 60 Marks
Final Marks: Internal + ExternalMarks : 100 Marks

10.2 Examiners for the conduct of Laboratory Examinations

For the conduct of Computer Laboratory Examinations, the Controller of Examinations of the college will appoint one external examiner, one internal examiner who shall normally be the Faculty-in-Charge of the Computer Laboratory Course. The examiners

will conduct the examinations and award the marks on the same day and forward the Mark List to the Controller of Examinations of the College.

There will be one question with or without subsections to be asked for the practical examination. Every question should be chosen from the question bank prepared by the examiner(s). i.e., each question may be repeated thrice in the same batch.

10.3. Distribution of Marks in the evaluation of Lab courses/Mini Project/ Internship/Major Project during External Examination.

10.3.1 Distribution of Marks in the evaluation of Lab courses

Logical Thinking Skill (Flow chart / Algorithm)	: 12 Marks
Coding Skill (writing syntax error free codes)	: 12 Marks
Debugging Skill (Entering, Debugging errors and Compilation)	: 12 Marks
Neatness in Presentation of the Output	: 12 Marks
Record Note Book	: 12 Marks

TOTAL: 60 Marks

10.3.2 DISTRIBUTION OF MARKS IN THE EVALUATION OF MINI PROJECT//INTERNSHIP

Dissertation	**Internal**	**External**
Problem for study	4 Marks	4 Marks
Knowledge in the System Requirement Specification	4 Marks	4 Marks
Development of Extra skill in the chosen software	4 Marks	4 Marks
Scientific writing capability	4 Marks	4 Marks
Implementation of the developed System	4 Marks	4 Marks

Viva-voce

Preparation of the Presentation (OHP/LCD etc.,)	10 Marks	20 Marks
Defense capability in oral examination	10 Marks	20 Marks
TOTAL	**40 Marks**	**60 Marks**

Total Internal Marks: 40; Total External Marks: 60

Final Marks: Internal + External Marks

10.3.3 DISTRIBUTION OF MARKS IN THE EVALUATION OF MAJOR PROJECT AND VIVA VOCE

Dissertation	**Internal**	**External**
Problem for study	4 Marks	8 Marks
Knowledge in the System Requirement Specification	4 Marks	8 Marks
Development of Extra skill in the chosen software	4 Marks	8 Marks
Scientific writing capability	4 Marks	8 Marks
Implementation of the developed System	4 Marks	8 Marks
TOTAL	**20 Marks**	**40 Marks**

Viva-voce	**Internal**	**External**
Preparation of the Presentation (OHP/LCD etc.,)	10 Marks	10 Marks
Defense capability in oral examination	10 Marks	10 Marks
TOTAL	**20 Marks**	**20 Marks**

Total Internal Marks: 40; Total External Marks: 60;
Final Marks: Internal +External Marks.

10.3.4 DISTRIBUTION OF MARKS IN THE EVALUATION OF TECHNICAL SEMINAR AND REPORT WRITING

Every student should submit a final paper as per project specifications along withall short review reports (**at least 5 internal reviews**) and corresponding evaluation comments to the concerned staff members.

Choice of subject and Review of Literature	: 20 marks
Organization and Interpretation	: 20 marks
Report Writing	:20 marks

During the final presentation marks will be awarded to

Project Presentation	: 20 marks
Viva-Voce	: 20 marks
Total	**: 100 marks**

Results and Evaluation for this term paper will be presented to fellow students and a committee of faculty members of the department with the Head of the Department as the coordinator.

10.3.5 SOFT SKILL COURSES –HUMAN VALUES & PROFESSIONAL ETHICS

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	PART A – Answer ALL (15 x 1 = 15marks) (Q.No 1- Q.No 15)	One word answers and fill in the blanks and choose the correct answers	15	60
K2, K3 (UNDERSTANDING & APPLYING)	PART B – Answer the following (10 x 2 = 20 marks)	Short answers	20	
K4, K5 (ANALYSING & EVALUATING)	PART C – Answer ALL (5 x 5 = 25 marks)	Short answers	25	
Activity based Evaluation	Story Delivery (10 marks) Role Play (10 marks) Questionaire(5 marks) Case Study and Presentation (10 marks) Class Interaction (5 marks)			40
		Total		100

Written Examination for 2 Hours duration at the end of the semester (Internal valuation only)

10.3.6 ENTREPRENEURIAL SKILL DEVELOPMENT

Problem of Study	: 20 marks
Knowledge about the problem	: 20 marks
Case study documentation	: 10 marks
Project Presentation	: 30 marks
Viva-Voce	: 20 marks
	Total: 100 Marks

10.3.7 VALUE ADDED COURSE

Written Examination for 3 Hours duration at the end of the semester

(Internal valuation only)

11. QUESTION PAPER PATTERN

11.1 INTERNAL QUESTION PAPER PATTERN

KNOWLEDGE LEVEL (as per revised Bloom's Taxonomy)	Maximum **: 40 Marks;** Duration**: 3 Hrs.**
K1, K2 **(REMEMBERING & UNDERSTANDING)**	**PART –A (5 X 2 = 10 Marks)** Answer **ALL Questions** **(**Each question carries **2Marks**)
K2, K3 **(UNDERSTANDING & APPLYING)**	**PART-B (5X 2 = 10 Marks)** Answer any **TWO** questions out of THREE questions
K4,K5 **(ANALYZING &EVALUATING)**	**PART-C (10 X 2 = 20 Marks)** Answer **TWO** Questions of Internal Choice

11.2 EXTERNAL QUESTION PAPER PATTERN

A. WRITTEN EXAMINATION: CORE, ELECTIVE AND EXTRA DISCIPLINARY COURSES

KNOWLEDGE LEVEL (as per revised Bloom's Taxonomy)	Maximum **: 100 Marks;** Passing Minimum **: 50 Marks;** Duration**: 3 Hrs.**
K1, K2 **(REMEMBERING & UNDERSTANDING)**	**PART –A (10 X 2 = 20 Marks)** Answer **ALL Questions** **(**Each question carries **2Marks**) 1,2Question from Unit I 3,4Question from Unit II 5,6 Question from Unit III 7,8 Question from Unit IV 9,10 Question from Unit V
K2, K3 **(UNDERSTANDING & APPLYING)**	**PART-B (5X 6 = 30 Marks)** Answer any **FIVE** questions out of SEVEN questions (Each question carries**6Marks**) 11. Question from Unit I 12. Question from Unit II 13. Question from Unit III 14. Question from Unit IV 15. Question from Unit V 16. Question from Unit I/II/III/IV/V(based on the complexity) 17. Question from Unit I/II/III/IV/V(based on the complexity)
K4,K5 **(ANALYZING &EVALUATING)**	**PART-C (5 X 10 = 50 Marks)** Answer **ALL** Questions (Each question carries **10 marks**) 18. a Question from Unit I (Or) b. Question from Unit I 19. a.Question from Unit II (Or) b.Question from Unit II 20.a. Question from Unit III (Or) b.Question from Unit III 21.a. Question from Unit IV (Or) b. Question from Unit IV 22.a. Question from Unit V (Or) b.Question from Unit V

Question papers should be setfor maximum of 100 marks and the answer scripts should be evaluated for the same. **The awarded marks should be converted to 60 Marks.**

12. FORMAT FOR THE PREPARATION OF RECORD/PROJECT WORK

12.1 Record of Laboratory work in the case of Programming exercises

(a) Aim
(b) Flowchart and/or Algorithm
(c) Source Code
(d) Printout(s)
(e) Result.

12.2 Format for the Project Work

(a) Title page
(b) Bonafide Certificate
(c) Acknowledgement
(d) Table of contents
(e) Summary of content
(f) Chapter-wise report
(g) References
(h) Appendices, if any

12.3 Format of the Title Page

TITLE OF THE PROJECT

A project report
Submitted in partial fulfillment for
the award of the Degree of
Master of Computer Applications

by

Candidate's name (Register Number)

Under the guidance of
Guide's name

Name of the Department
College Name
Month and Year

12.4 Format of the Certificate

For Dissertation	For Laboratory Records
CERTIFICATE This is to certify that the technical report entitled **"TITLE OF THE PROJECT"** being submitted to the Ethiraj College for Women,(Autonomous). affiliated to the University of Madras, Chennai by Candidate's name (Reg. No:) In partial fulfillment for the award of the Degree of **Master of Computer Applications** is a bona fide record of work carried out by her under my guidance and supervision Date: Signature Signature of the Place: of the Guide HOD Submitted for the viva-voce examination at…… ..…… on …….. Examiner-1: ……. (Signature and Name of the Examiner) Examiner-2: ……. (Signature and Name of the Examiner)	**CERTIFICATE** This is to certify that this is the bonafide record of work carried out under my supervision in the Computer Laboratory Course: **"TITLE OF THE LABORATORY COURSE"** submitted to the Ethiraj College for Women,(Autonomous). affiliated to the University of Madras, Chennai by Candidate's name (Reg. No:) as a part of Course work leading to the award of the Degree of **Master of Computer Applications** Date: SignatureSignature of the Place: of the FacultyHOD Submitted for Laboratory Examination at…… ..…… on …….. Examiner-1: ……... (Signature and Name of the Examiner) Examiner-2: …… (Signature and Name of the Examiner)

12. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

Candidates shall register their names for the First Semester Examination after the admission in the Master's Programme. Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester examinations subject to the condition that the candidates should register for all the arrear courses of earlier semesters along with current (subsequent) semester courses. Candidates shall be eligible to go to subsequent semester, only if they earn sufficient attendance as prescribed therefore by the College from time to time**.**

"Provided in the case of candidate earning not less than 50% of attendance in any one of the semesters due to any extraordinary circumstance such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorized Medical Attendant (AMA), duly certified by the Principal of the College, shall be permitted to proceed to the next semester and to complete the course of study. Such candidate shall have to repeat the missed semester by rejoining after completion of final semester of the course, after paying the fee for the break of study as prescribed by the College from time to time".

COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2020, for students who are admitted to the first year of the course during the academic year 2020and thereafter.

TRANSITORY PROVISION

Candidates who were admitted to the course of study in 2020 under this Master's Programme shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the first semester examination of 2020. Thereafter, they will be permitted to appear for the examination only under the regulations then in force.

SEMESTER I
PYTHON PROGRAMMING

Teaching Hours: 60 Hrs **CODE : MCA20/1C/PPG**
Credit : 4 **L T P : 4-0-0**

COURSE OBJECTIVES

To enable the post graduate students to

1. To learn how to design and program Python applications.
2. To learn how to use lists, tuples, and dictionaries in Python programs.
3. To learn how to identify Python object types.
4. To learn object oriented concepts.
5. To define the structure and components of a Python program

UNIT I : Python- introduction- Program Input/output statement– Python Basics – Statements and syntax – Variable Assignment –Double Precision Floating Point Numbers – Complex Numbers – Operators – Built-in functions for all numeric types – Conditionals and Loops – Functions and Functional Programming – What are functions? – Calling Functions – Creating Functions – Passing Functions – Formal Arguments – Variable-Length Arguments.**12 Hrs**

UNIT II : Data structure : Lists and Tuples – Sequences – Strings –Built-in Functions – List Type Built-in Methods – Tuples –Set Types: Dictionaries –Modules : Modules – Modules and Files – Namespaces – Importing Modules – Features of Module Import – Module Built-in Functions – Packages – Other Features of Modules**. 12 Hrs**

UNIT III : Object oriented Design: Introduction object oriented – Object and classes – Specifying attributes and behaviors- Hiding details and creating the public interface – Composition – Inheritance. Objects in Python: Creating python classes – Modules and packages – Organizing module contents. Basic Inheritance – Multiple Inheritance – Polymorphism –Abstract base classes. **12 Hrs**

UNIT IV : Expecting the Unexpected: Raising Exceptions. When to use Objectoriented Programming: Treat objects are objects – Adding behavior to class data with properties – Manager objects. Python Object-oriented Shortcuts: Python built-in functions – An alternative to method overloading – Functions are objects too**. 12 Hrs**

UNIT V : Strings and Serialization: String Manipulation – String formatting – Strings are Unicode – Regular Expressions – Matching patterns – Serializing objects. The Iterator Pattern: Iterators – Comprehensions – Generators – Co-routines. Testing Object–oriented Programs Unit testing – Testing with py.test-Imitating expensive objects –Case study. **12 Hrs**.

RECOMMENDED TEXTBOOKS:

1. Dusty Phillips, "Python 3 Object-oriented Programming", 3rd Edition, PACKT Publishing, 2018. Unit 3,4,5

2. Wesley J. Chun, "Core Python Programming", 2nd Edition, Pearson Education LPE, New Delhi, 2007. Unit 1,2

REFERENCE BOOKS:

1. Mark Summer field, Programming in Python 3, Pearson Education LPE, New Delhi, 1996.

JOURNALS:

1. https://www.researchgate.net/profile/David_Steffelbauer/publication/281437935_OOPNET_An_object-oriented_EPANET_in_Python/links/55e6d5d608aed3ee06b4c82e.pdf

E-LEARNING RESOURCES:

1.https://nptel.ac.in/courses/106/106/106106182/
2.https://www.coursera.org/learn/python?specialization=python
3.https://www.learnpython.org/
4.https://www.coursera.org/learn/python-data?specialization=python
5.https://www.coursera.org/learn/python-network-data?specialization=python

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Learn basic Python programming
CO 2	Gain working knowledge about Python data structures.
CO 3	Apply the concepts of object-oriented programming in Python.
CO 4	Learn to handle the exception occur in python.
CO 5	Learn to test object oriented python programme.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	2	3	2	3	3
CO 3	2	2	2	3	3
CO 4	2	2	2	3	3
CO 5	2	2	2	3	3
Average	**2**	**2.2**	**2**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, learning through Demonstrations, LCD Projectors, e-content, Realization of Tools, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER I
DIGITAL COMPUTER FUNDAMENTALS

TOTAL HOURS: 60 Hrs **COURSE CODE: MCA20/1C/DCF**
CREDITS : 4 **L-T-P: 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Identify various number systems and work with Boolean algebra.
2. Realize various logic gates and their implementations.
3. Simplify the Boolean expression using K -Map and Tabulation techniques
4. Analyze various types of flip flops used for designing registers and Counters.
5. Understand the Register transfer logic and Micro operations.

COURSE OUTLINE:

UNIT I: Number system: converting numbers from one base to another-complements- Binary Codes -Binary storage and registers- Binary Logic- Integrated Circuits Boolean Algebra- Boolean Functions-Canonical and standard forms- Other Logic operations-Digital Logic gates. **12hrs**

UNIT II: Simplification of Boolean Functions: K-map method Simplification- Product of Sums- NAND NOR implementation- Don't Care Conditions - The Tabulation method.

12hrs

UNIT III: Combinational Logic: Introduction - Design Procedures - Adders-Sub tractors- Code Conversion- Multilevel NAND NOR circuits- XOR and Equivalence function- Binary Parallel Adder- Decimal Adder- Decoders- Multiplexers.

12hrs

UNIT IV: Sequential Logic: Flip flops- Triggering of Flip Flops- Clocked Sequential Circuits- Design of Counters- Registers- Shift Registers- Ripple Counters and Synchronous Counters. **12hrs**

UNIT V: Register Transfer Logic: Introduction- Inter register Transfer- Shift Micro Operations- Conditional Control Statement- Fixed point binary Data- Overflow- Arithmetic Shifts- Decimal Data- Floating point Data- Non numeric Data- Instruction Codes- Design of Arithmetic and Logic Unit. **12hrs**

RECOMMENDED TEXTBOOKS:

1. Morris Mano, Digital Logic and Computer Design, PHI, Sixth Edition 2013.
2. M.M. Mano and C. R. Kime, Logic and Design Fundamentals, Pearson Education, Fifth Edition, 2015.

REFERENCE BOOKS:

1. Thomas Bartee, Digital Logic Fundamentals, 6th Edition, Tata McGraw Hill, 2015.
2. K. Shashidhar, Digital & Computer Fundamentals, Sapna Book House, 2014.
3. A. Anand Kumar, Fundamentals of Digital Circuits, PHI, Fourth Edition 2014.

JOURNALS:

1. https://digital-library.theiet.org/content/journals/iet-cdt
2. https://www.elsevier.com/books/an-introduction-to-digital-computing/george/978-0-08-011280-0

E-LEARNING RESOURCES:

1. https://www.oreilly.com/library/view/fundamentals-of-digital/9781118969504/9781118969504c01.xhtml
2. http://scanlibs.com/logic-computer-design-fundamental.
3. https://www.britannica.com/technology/digital-computer
4. https://www.scribd.com/doc/45720966/Digital-Electronics-Computer-Fundamentals-theory
5. https://learn.sparkfun.com/tutorials/digital-logic#boolean-logic-in-programming

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Gain a clear understanding of the concepts that underlie digital computer fundamentals along with logic circuits and implementations.
CO 2	Define key mechanisms and analyse different logic gates and their realizations.
CO 3	Correlate different Boolean expression simplification techniques and coordinate with its implementation.
CO 4	Understand the steps involved in designing flip-flops and counters
CO 5	Realize the possible micro operations that can be performed by means of Register Transfer Logic.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	2	3	2	3
CO 4	3	3	3	2	2
CO 5	3	2	2	3	3
Average	**2.8**	**2.4**	**2.4**	**2.2**	**2.4**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Realization of Logic Gates, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER I
DATABASE MANAGEMENT SYSTEMS

TOTAL HOURS: 60 Hrs **COURSE CODE: MCA20/1C/DMS**
CREDITS : 4 **L-T-P : 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Understand the basics of database, data models and various structures of SQL statements.
2. The introduction of ER models, various constraints and the normalization techniques
3. Expose the different types of data storage medium, RAID Architecture and indexing techniques.
4. Impart knowledge in Transaction processing, Concurrency Control and Recovery System
5. Understand the concepts of concurrency control, the protocols used and various recovery algorithms during transaction failures. Also students gains knowledge about the servers oracle and Microsoft SQL server

COURSE OUTLINE:

UNIT I: Introduction: Relational Model – Introduction to SQL – Intermediate SQL – Advanced SQL **12 Hrs**

UNIT II: Database Design and ER model: Overview – E-R Model , Constraints – Removing Redundant Attributes – E-R Diagrams – Extended ER Features – Relational Database Design **12 Hrs**

UNIT III: Storage and File Structure : Physical Storage media – Magnetic Disk and Flash Storage – RAID-Tertiary Storage – File Organization of Records in Files – Data Dictionary Storage – Database Buffer - Indexing and Hashing **12 Hrs**

UNIT IV Query Processing: overview – Measures of Query Cost – Selection Operation – Sorting – Join operations – Query Optimization – Transformation of Relational Expressions – Estimating Statistics – Choice of evaluation Plans - Transactions – Concepts – Transaction Model-Storage Structure – Atomicity and Durability – Transaction Isolation – Serializability.**12 Hrs**

UNIT V Concurrency Control: Lock Based Protocols – Timestamp Based protocols-Validation Based Protocols – Recovery System – Failure Classification – storage – Recovery and Atomicity – Recovery Algorithm – Buffer Management - Case Study – Oracle – Microsoft SQL Server **12 Hrs**

RECOMMENDED TEXTBOOKS:

1 Abraham Silberschatz , Henry F. Korth , S. Sudarshan " Database System concepts, 6th Edition, McGraw Hill Education, 2013.
2 C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3 Raghu Ramakrishnan , "Database Management Systems", 4th Edition, Tata Mcgraw Hill 2011.

REFERENCE BOOKS:

1 Ivan Bayross , "SQL, PL/SQL: The Programming Language of Oracle", BPB Publications , 2002
2 Elmasri, Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education (2008).
3 Jeffrey A. Hoffer, Ramesh Venkataraman, , HeikkiTopi, "Modern Database Management", Pearson Education 2016
4 Jeffrey A. Hoffer, Mary B. Prescott, Fred R. McFadden, "Modern Database Management"
8th Edition, Prentice Hall, 2006
5 Mark L. Gillenson, Fundamentals of Database Management Systems, 2nd Edition, Kindle Edition

JOURNALS:

1 https://www.journals.elsevier.com/data-and-knowledge-engineering
2 https://www.scimagojr.com/journalsearch.php?q=13581&tip=sid

E-LEARNING RESOURCES:

1 https://nptel.ac.in/courses/106105175/
2 http://codex.cs.yale.edu/avi/db-book/db6/slide-dir/
3 https://www.cse.iitb.ac.in/~sudarsha/db-book/slide-dir/
4 https://www.coursera.org/learn/database-management
5 https://www.coursera.org/learn/core-database

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Understand the fundamentals of the database and data models and SQL
CO 2	Design a database using ER diagrams and map ER into Relations and compare the normalized relations by I NF, II NF, III NF, IV NF and BCNF
CO 3	Know the different physical media for storage, different file organizations and understand how indexing and hashing used for effective storage of databases
CO 4	Acquire the knowledge of query evaluation and optimization to monitor the performance of the DBMS
CO 5	Illustrate various concurrency control protocols and recovery algorithms from failures. Construct a mini project using servers like Oracle or SQL Server as backend

MAPPING-CO with PSO:

CO / PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO5
CO 1	2	3	2	3	2
CO 2	2	3	3	3	3
CO 3	3	2	2	2	2
CO 4	3	2	2	3	3
CO 5	2	3	3	2	3
Average	**2.4**	**2.4**	**2.4**	**2.6**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

'Chalk and Talk' with blend of laboratory sessions, Team work through projects, class activities, Use of ICT tools like Massive Open Online Courses (MOOCs), videos, Talks by personnel from industry/academia, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER I
COMPUTER LABOTATORY-I: PYTHON PROGRAMMING

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/1P1/PPG**
CREDITS : 2 **L-T-P : 0-0-5**

COURSE OBJECTIVES:
To enable the post graduate students to
1. Learn basic python programming.
2. Understand Object oriented concept and implementing in python.
3. Implementing all oops concept.
4. Handling differentdata via oops concept.

LIST OF PROGRAMMES

Python Basics

1. Write a Python program to convert a roman numeral to an integer.
2. Write a menu driven python program with the following operations
    a. To reverse the digits of a given integer.
    b. Display all prime numbers between 0 to 100
3. a. Write a Python program to multiply matrices using numpy.
   b. Write a Python program to display product price details in histogram.

Data structures &Files

4. Write a Python program to create a LIFO stack with the basic operations.
5. Python Program to Read a Text File and Print all the Numbers Present in the Text File.
6. Write a Python program to create a FIFO queue with the basic operations.
7. Write a Python program to get all possible unique subsets from a set of distinct integers.

OOP Concepts

8. Write a Python program to create a Balanced Binary Search Tree (BST) using an array (given) elements where array elements are sorted in ascending order.
9. Write a Python program to perform add item, delete item, search a specific item in a singly linked list.
10. Write a Python program to display the student mark sheetusing an enum class ordered by their values.

E-LEARNING RESOURCES:
1. https://www.w3resource.com/python-exercises/
2. https://www.edureka.co/blog/python-numpy-tutorial/
3. https://www.geeksforgeeks.org/numpy-in-python-set-1-introduction/

TEACHING METHODOLOGY:

Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Quiz, Hands on session.

QUESTION PAPER PATTERN:

Knowledge Level	Section-A	Marks	Total
K2, K3 (UNDERSTANDING & APPLYING)	1 Question	30	60
K3, K4 (APPLYING & ANALYSING)	1 Question	30	

SEMESTER I
COMPUTER LABORATORY-II: DATABASE MANAGEMENT SYSTEMS

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/1P2/DMS**
CREDITS : 2 **L-T-P : 0-0-5**

COURSE OBJECTIVES:

To enable the post graduate students to
1. Understand the concepts of DBMS
2. Familiarize with SQL queries
3. Write stored procedures in DBMS
4. Learn front end tools to integrate with databases.

COURSE OUTCOME:

CO No	CO Statements
CO1	To learn various fundamental and complex SQL queries
CO2	Learn to develop a project in the area of their interest

Students have to develop a project based on their choice and submit a report at the end of the semester

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	2	3
CO 2	3	3	2	2	2
Average	**3**	**3**	**2**	**2**	**2.5**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

QUESTION PAPER PATTERN:

Knowledge Level	Section-A	Marks	Total
K2, K3 (UNDERSTANDING & APPLYING)	1 Question	30	60
K3, K4 (APPLYING & ANALYSING)	1 Question	30	

SEMESTER II
ADVANCED JAVA PROGRAMMING

TOTAL HOURS: 60 Hrs **COURSE CODE: MCA20/2C/AJP**
CREDITS: 4 **L-T-P: 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Understand the importance of Enterprise Applications, role of JDBC
2. Learn, develop the server side and client side components
3. Create and send Java mail and JMS
4. Analyze and apply the Enterprise components
5. Use the Frameworks

COURSE OUTLINE:

UNIT I : J2EE overview: The beginning of Java- Java Byte code- Advantages of Java- J2EE and J2SE- J2EE Multi-tier Architecture-J2EE Best Practices- J2EE Design Pattern-Concept. **10 Hrs**

UNIT II :J2EE Database concepts: Data- Database- Database schema –JDBC objects: JDBC Driver types- JDBC Packages – Overview of JDBC Process-database connection-JDBC-ODBC Bridge- statement objects- Result Set- Transaction Processing- Meta data- Java and XML **12 Hrs**

UNIT III:Java Servlets &JSP: Servlets and CGI- anatomy of servlet-Deployment Descriptor- Reading data from client- Reading HTTP Request Headers- Sending data to a client- working with cookies- Tracking sessions- JSP- Installation- JSP Tags- Tomcat-Request String- user Sessions- cookies- session Objects- RMI- Java RMI – Remote Interface- passing objects- RMI Process- server - client side.**14 Hrs**

UNIT IV: Enterprise Java Beans: Deployment Descriptors- Session Bean- Entity Java Bean-Message Driven Bean- Java Mail- Protocols-exceptions- sending ,Retrieving ,Deleting and Reply to, Forwarding an Email Message- Receiving attachments- searching an Email Folder. **12 Hrs**

UNIT V: Java Message Service: JMS fundamentals- Components of JMS Program-messages- message selector- sending messages to a queue- receiving messages – compiling and running queue programs- creating a publisher- creating a subscriber- compile and running the publisher and subscriber- JNDI- Naming and Directories- JND Interface- Naming Operations. **12Hrs**

RECOMMENDED TEXTBOOKS:

1.Java6 and J2EE1.5 Black Book,Kogent learning solutions, Wiley India, 2014
2. J2EE : The Complete Reference, Jim Keogh,Mc-Graw Hill,Reprint2014

REFERENCE BOOKS:

1.Teach Yourself J2EE in 21 Days,Martin Bond, Debbie Law, SamsPublishing,Reprint
2.Rapid J2ee Development: An Adaptive Foundation for Enterprise Applications, Alan Monnox, Prentice Hall,2005,
3.Pro J2EE 1.4: From Professional to Expert ,Apress

JOURNALS:

1.https://www.journals.elsevier.com/science-of-computer-programming
2.http://java.sys-con.com/

E-LEARNING RESOURCES:

1.https://www.udemy.com/course/how-to-connect-java-jdbc-to-mysql/
2.https://www.udemy.com/course/jsp-servlet-free-course/
3.https://www.udemy.com/course/java-message-service-jms-fundamentals/
4.https://www.udemy.com/course/the-java-ee-course/
5.https://www.udemy.com/course/advanced-java-programming-java-se-7-vtc/

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Know the importance of Enterprise Applications, role of JDBC
CO 2	Understand ,implement the server side and client side components
CO 3	Understand the Javamail, JMS components
CO 4	Learn and apply EJB in Enterprise applications
CO 5	Understand Frameworks in the realtime application development

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO5
CO 1	2	2	2	3	2
CO 2	2	3	2	2	2
CO 3	3	2	3	2	2
CO 4	3	3	3	3	2
CO 5	3	2	2	2	2
Average	2.6	2.4	2.4	2.4	2

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, learning through Demonstrations, LCD Projectors, e-content, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II
CRYPTOGRAPHY AND NETWORK SECURITY

TOTAL HOURS:60 Hrs **COURSE CODE:MCA20/2C/CNS**
CREDITS: 4 **L-T-P : 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Know the methods of conventional encryption and techniques
2. Understand the concepts of public key encryption and cryptosystem
3. Learn Key exchange Algorithms and their applications
4. Understand authentication and to know the network security tools and applications
5. Learn the system level security and IP security.

COURSE OUTLINE:

UNIT I: Overview, Symmetric Ciphers, Classical Encryption Techniques, Block Ciphers and the Data Encryption Standard.**12Hrs**

UNIT II:AES: Transformation Functions – Key Expansions - Block Cipher Operation – Multiple Encryption and Triple DES – ECB – CBC – CFM – OFM – Counter Mode. **12 Hrs**

UNIT III: Public Key Encryption: Principles of Public Key Cryptosystems - RSA Algorithm – Daffy - Hellman Key Exchange Protocol. **12Hrs**

UNIT IV: Key Management and Distribution: – Distribution of Public keys – X.509 Authentication Service – User Authentication – Kerberos Authentication – Federated Identity Management – Personal Identity Verification.

12 Hrs

UNIT V: Electronic Mail Security: Internet Mail Architecture- E-mail formats- E-mail threats – S/MIME-PGP - IP Security – Overview – IP Security Policy – Encapsulating Security Payload.**12Hrs**.

RECOMMENDED TEXTBOOKS:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", Pearson, Seventh Edition, 2017.
2. AtulKahate, "Cryptography and Network Security", Tata McGraw-Hill, 2013.

REFERENCE BOOKS:

1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2011.
2. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2013.

JOURNALS:

1. https://wireilla.com/ijcis/index.html
2. https://ieeexplore.ieee.org/document/4646371/
3. https://www.journals.elsevier.com/network-security

E-LEARNING RESOURCES:

1. https://freevideolectures.com/course/5027/cryptography-and-network-security
2. https://www.coursera.org/lecture/cryptography/public-key-encryption-40Sb3
3. https://www.coursera.org/learn/asymmetric-crypto
4. https://www.udacity.com/course/applied-cryptography--cs387

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Impart knowledge on Encryption techniques, Design Principles and Modes of Operation
CO 2	Design a security solution for a given application
CO 3	Devise the Key Management techniques
CO 4	Create an understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works.
CO 5	Examine the issues and structure of Authentication Service and Electronic Mail Security

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	3
CO 2	2	3	2	3	3
CO 3	2	2	2	3	3
CO 4	3	2	3	3	2
CO 5	3	3	3	3	3
Average	**2.4**	**2.4**	**2.6**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Realization of security problems, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II
SOFTWARE TESTING

TOTAL HOURS: 60 Hrs **COURSE CODE: MCA20/2C/ STG**
CREDITS : 4 **L-T-P : 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Explore the basics of various testing strategies.
2. Distinguish the essential need and necessity for testing strategies.
3. Investigate the strategies involved in variants of testing platforms.
4. Discern the significance of testing tools and their usage.
5. Comprehend the entities needed for Quality Management.

COURSE OUTLINE:

UNIT I: Introduction: Software Testing-testing process-White Box Approach to Test design - Test Adequacy Criteria – Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Their Role in White box Based Test Design – Code Complexity Testing – Evaluating Test Adequacy Criteria. Test Case Design Strategies – Using Black Box Approach to Test Case Design – Random Testing – Requirements based testing – Boundary Value Analysis –Decision tables – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Error guessing – Compatibility testing – User documentation testing – Domain testing.

12hrs

UNIT II: The Need for Levels of Testing- Unit Test Planning –Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Defect Bash Elimination. System Testing – Acceptance testing – Performance testing – Regression Testing - Internationalization testing - Ad-hoc testing – Alpha, Beta Tests- Testing OO systems – Usability and Accessibility Testing – Configuration Testing - Compatibility Testing – Testing the documentation – Website Testing - Case Study for Unit and Integration Testing. **12hrs**

UNIT III: Testing Client / Server Systems – Testing in a Multiplatform Environment - Testing Object Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software – Challenges in Testing for Web-based Software –. Case Study: Web Application Testing.

12hrs

UNIT IV: Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation – Tracking the Bug – Debugging – Case study using automation testing tool **12 hrs**

UNIT V: Quality Aspects – Web Engineering – Testing of Web based Systems -Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality. Case Study for Complexity and Object Oriented Metrics. **12hrs**

RECOMMENDED TEXTBOOKS:

1. Adithya P. Mathur, "Foundations of Software Testing – Fundamentals algorithms and techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
2. Boris Beizer, "Software Testing Techniques", Dream Tech Press, 2009.
3. Dale H. Besterfiled, "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2011).

REFERENCE BOOKS:

1. Edward Kit, "Software Testing in the Real World – Improving the Process", Pearson Education, 1995.
2. Glenford J. Myers, Tom Badgett, Corey Sandler, "The Art of Software Testing", 3rd Edition, John Wiley & Sons Publication, 2012.
3. NareshChauhan , "Software Testing Principles and Practices " Oxford University Press , New Delhi ,2010.

JOURNALS:

1. https://onlinelibrary.wiley.com/journal/10991689
2. https://www.sciencedirect.com/science/article/pii/S1571066106000442

E-LEARNING RESOURCES:

1 https://www.softwaretestingmaterial.com/selenium-tutorial/

2 https://www.softwaretestingclass.com/wp-content/uploads/2016/06/Beginner-Guide-To-Software-Testing.pdf

3 http://moodle.nccu.edu.tw/pluginfile.php/77731/mod_resource/content/1/software_testing.pdf

4 http://testingmasters.com/wp-content/uploads/ManualTestingMaterial.pdf

5 https://www.softwaretestinggenius.com/download/mtnarsir.pdf

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Study over the basics of testing strategies and its applications.
CO 2	Move on with the flow in which the testing strategies to be applied to the product is being developed.
CO 3	Learn the testing strategies to be adapted for different platforms.
CO 4	Evaluate the testing tools best suited for automating the testing process.
CO 5	Assess the performance levels for ensuring the Quality Management.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	3	2
CO 2	3	3	2	3	3
CO 3	3	2	2	3	3
CO 4	3	3	2	2	3
CO 5	2	2	3	3	2
Average	**2.8**	**2.4**	**2.2**	**2.8**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Understanding of Testing strategies, Group Discussion, Assignment, Quiz, Peer Learning and Seminar and field visit.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II

COMPUTER LABORATORY-III: ADVANCED JAVA PROGRAMMING

TOTAL HOURS: 45Hrs **COURSE CODE: MCA20/2P3/AJP**
CREDITS:2 **L-T-P : 0-0-5**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Design and develop a web application using IDE.
2. Apply the business logic for various real-time applications.

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Writing JDBC connectivity to post and retrieve through a web application.
CO 2	Developing real time applications using the servlet, JSP in IDE.

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO5
CO 1	3	3	3	2	2
CO 2	3	3	2	2	2
Average	3	3	2.5	2	2.3

LIST OF EXERCISES:

1. Program to prompt the user for a hostname and then looks up the IP address for the hostname and displays the results.
2. Program to read the webpage from a website and display the contents of the webpage.
3. Programs for TCP server and Client interaction as per given below.
   i. Program to create TCP server to send a message to client.
   ii. Program to create TCP client to receive the message sent by the server.
4. Program to display a greeting message in the browser by using HttpServlet.
5. Program to design a loan calculator in aJSP Page and display using HttpServlet.
6. Program to display a list of five websites in a JSP page and visit to the selected website by using Response redirection.
7. Program to store the user information into Cookies. Write another program to display the above stored information by retrieving from Cookies.
8. Program by using JDBC to execute a SQL query for a database and display the results.
8. Program by using JDBC to execute an update query by using Prepared Statement and display the results.
9. Program to execute a stored procedure in the database by using Callable Statement and display the results.
10. Program to track session using servlet.

11. Program to develop an Enterprise Java Bean of "Session Bean" type.
12. Program to develop an Enterprise Java Bean of "Entity Session Bean" type.
13. Program to develop an Enterprise Java Bean of "Message Driven Bean" type.
14. Program to develop an application using RMI.
15. Program to send an e-mail.

E-LEARNING RESOURCES:

1.https://javaee.github.io/tutorial
2.https://docs.oracle.com/javaee/7/tutorial
3.https://netbeans.org/kb/trails/java-ee.html
4.https://www.oracle.com/technetwork/articles/javaee/tutorials-

QUESTION PAPER PATTERN:

Knowledge Level	**Section-A**	**Marks**	**Total**
K2, K3 (UNDERSTANDING & APPLYING)	1 Question	30	60
K3, K4 (APPLYING & ANALYSING)	1 Question	30	

SEMESTER II
COMPUTER LABORATORY-IV:SOFTWARE TESTING

TOTAL HOURS : 45 Hrs **COURSE CODE : MCA20/2P4/STG**
CREDITS : 2 **L-T-P : 0-0-5**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Validate the web page through test suite using selenium IDE.
2. Verify the programs intended for various real-time problems.

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Writing test suite containing test cases to check web page contents using selenium IDE.
CO 2	Developing test case to ensure the functionality of Program entities using selenium IDE.

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	3	2	2	3
CO 2	3	3	2	2	2
Average	**3**	**3**	**2**	**2**	**2.5**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, Corelation-0

LIST OF EXPERIMENTS:

1. Write test script for manual testing of statement coverage, Branch coverage, cycloramic complexity

2.Using Selenium IDE, Write a test suite containing minimum 4 test cases.

2. Install Selenium server and demonstrate it using a script in Java/PHP.

3. Write and test a program to login a specific web page.

4. Write and test a program to update 10 student records into table into Excel file.

5. Write and test a program to select the number of students who have scored more than 60 in any one subject (or all subjects)

6. Write and test a program to provide total number of objects present / available on the page

7. Write and test a program to get the number of list items in a list / combo box.

8. Write and test a program to count number of check boxes on the page checked and unchecked count.

E-LEARNING RESOURCES:

1 https://www.seleniumhq.org/docs/01_introducing_selenium.jsp

2 https://www.softwaretestingmaterial.com/selenium-tutorial/

TEACHING METHODOLOGY:

Learning through Demonstrations, Hands-on sessions, Dry-run methodology and Trial and Error methods.

QUESTION PAPER PATTERN:

Knowledge Level	Section-A	Marks	Total
K2, K3 (UNDERSTANDING & APPLYING)	1 Question	30	60
K3, K4 (APPLYING & ANALYSING)	1 Question	30	

SEMESTER III
XML AND WEB SERVICES

TOTAL HOURS: 60 Hrs **COURSE CODE: MCA20/3C/ XWS**
CREDITS : 4 **L-T-P : 4-0-0**

OBJECTIVES:

To enable the post graduate students to

1. Learn the role of XML,web services in commercial applications, the principles of web service provision,use of Java for implementing web services,
2. Demonstrate the ability to apply theory and techniques to unseen problems without references to notes.
3. Work independently, and to work under a time constraint.

COURSE OUTLINE:

UNIT I : Role of XML : XML and The Web - XML Language Basics - SOAP - Web Services - Revolutions Of XML –Components of XML. XML Grammarrules. **12 Hrs**

UNIT II : XML: Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure. **12 Hrs**

UNIT III : XML : Based protocols and SOAP – SOAP Encoding – SOAP Message exchange model – SOAP Communication – SOAP Messaging –Message Structure – Message elements – Processing model – SOAP Security - WSDL–Functional Characteristics of Services. **12 Hrs**

UNIT IV : WSDL 1.2: UDDI – categorizing services – identifiers – Business Entity Relationships – UDDI's SOAP interfaces – UDDI's and SOAP / WSDL Relationship – Publishing WSDL Service Interfaces in UDDI – ebXML – architectural overview of ebXML. **12 Hrs**

UNIT V : Security Overview: Canonicalization - XML Security Framework - XML Encryption XML Digital Signature - XKMS Structure - Guidelines For SigningXML Documents **12 Hrs**

BOOKS FOR REFERENCES:

1. Frank P. Coyle XML, Web Services and the Data Revolution, Pearson Education, Edition, (Unit I, Unit II),2016.
2. James McGovern, Sameer Tyagi , Java Web Services Architecture, Morgan Kaufmann Publishers. (Unit IV and Unit V) 2013.
3. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2015.

E-LEARNING RESOURCES:

1.www.sfubusiness.ca/motmba/courses/bus756/shared/pages
2.www.kent.k12.wa.us/KSD/IT/TSC/prof_dev/tutorials.html

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Study over the basics of XML and its applications.
CO 2	Move on with the flow in which the formatting strategies to be applied to the product is being developed.
CO 3	Learn the XML programing strategies to be adapted for different platforms.
CO 4	Evaluate the XML best suited for automating the Web Services.
CO 5	Assess the performance levels for ensuring the Web Services.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	3	2
CO 2	3	3	2	3	3
CO 3	3	2	2	3	3
CO 4	3	3	2	2	3
CO 5	2	2	3	3	2
Average	**2.8**	**2.4**	**2.2**	**2.8**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, learning through Demonstrations, LCD Projectors, e-content, Understanding of Testing strategies, Group Discussion, Assignment, Quiz, Peer Learning and Seminar and field visit.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
MACHINE LEARNING

TOTAL HOURS : 60 Hrs **COURSE CODE : MCA20/3C/MLG**
CREDITS : 4 **L-T-P : 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Learn basic ML algorithms and techniques and their applications extensively.
2. Develop a basic understanding of the principles of machine learning and derive practical solutions using predictive analytics.
3. Know several software libraries and data sets publicly available will be used to illustrate the ML application.
4. Use data patterns to make decisions and predictions with real-world examples.
5. Learn real life case studies and identify the solutions.

COURSE OUTLINE:

UNIT I : **Introduction to Machine Learning:** Types of Human Learning – Types of Machine Learning – Applications of Machine Learning – Tools in Machine Learning –**Preparing to Model :**Machine Learning Activities – Basic types of Data in ML – Exploring of Data – Data quality remediation – Data Pre-processing. **12 Hrs**

UNIT II : **Modelling and Evaluation :** Selecting a Model – Training a Model – Model Representation and interpretability – Evaluating performance of a Model. **Basic of Feature Engineering:** Introduction – Feature Transformation – Feature Subset Selection. **Brief Overview of Probability:** Introduction – Importance of Statistical tools in ML – Concept of Probability. **12 Hrs**

UNIT III : Random Variables – Bernoulli Distribution – Binomial Distribution – Sampling Distribution. **Bayesian Concept Learning:** Bayes Theorem – Bayes Theorem and concepts – Bayesian Belief Network. **Supervised Learning:** Classification Model – Classification Learning Steps –Common Classification Algorithms. **12 Hrs**

UNIT IV : **Supervised Learning: Regression :**Introduction – Example of Regression – Common Regression Algorithms. **Unsupervised Learning: Regression:** Support Vector Machine – Linear and non Linear. **Learning with Neural Networks :**Towards Cognitive Machine – Network Architecture. **12 Hrs**

UNIT V : **Decision Tree Learning:** Example of Classification Decision Tree – Measures of Impurity for Evaluating Splits in Decision Trees – ID3 , CART Decision Trees – Pruning Tree – Strength and Weakness of Decision Tree Approach. **Machine Learning Workflow:** NYC Taxi Data –Advanced NLP example: Movie review sentiment – Scaling Machine Learning workflow**.** **12Hrs**

RECOMMENDED TEXTBOOKS:

1. SaikatDutt , Subramanian Chandramouli , Amit Kumar Das, Machine Learning , First Edition , Pearson India Services Pvt. Ltd , 2019. (Unit 1, 2, 3)
2. M.Gopal, Applied Machine Learning, McGraw Hill Education Pvt. Ltd , 2018. (Unit 4)
3. HenrikBrink , Joseph W. Richards, Mark Fetherolf , REAL – WORLD MACHINE LEARNING , Dreamtech Press , 2017. (Unit 5)

REFERENCE BOOKS:

1. Peter Harrington , Machine Learning in Action , Dreamtech Press , 2018.
2. Stephen Marsland, Machine Learning – An Algorithmic Perspective, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
3. Tom M Mitchell, Machine Learning, First Edition, McGraw Hill Education, 2013.
4. EthemAlpaydin , Introduction to Machine Learning , Third Edition , Eastern Economy Edition , 2017.

JOURNALS:

1. Machine Learning and Knowledge Extraction — Open Access Journal - https://www.mdpi.com/journal/make
2. https://link.springer.com/journal/10994
3. http://www.jmlr.org/papers/v20/

E-LEARNING RESOURCES:

1 https://nptel.ac.in/courses/106/106/106106139/
2 https://www.guru99.com/machine-learning-tutorial.html
3 https://nptel.ac.in/courses/106/106/106106202/
4 https://www.kaggle.com/kanncaa1/machine-learning-tutorial-for-beginners
5 https://cs.nyu.edu/~mohri/mlu11/

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Learn machine learning basics and Models of ML
CO 2	Gain knowledge about feature engineering and learn about statistical tool.
CO 3	Gain knowledge about supervised learning in ML
CO 4	Gain knowledge about unsupervised learning in ML
CO 5	Learn Decision tree algorithms and some real world problem implementation.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	2	3	2	3	3
CO 3	2	2	2	3	3
CO 4	2	2	2	3	3
CO 5	2	2	2	3	3
Average	**2**	**2.2**	**2**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Realization of Tools, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN

Knowledge Level	Section	Word Limit	Marks	Total
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K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
SOFT COMPUTING

TOTAL HOURS : 60 Hrs **COURSE CODE : MCA20/3C/SCG**
CREDITS : 4 **L-T-P : 4-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Learn the various soft computing frame works
2. Be familiar with design of various neural networks
3. Be exposed to fuzzy logic
4. Learn genetic programming.

COURSE OUTLINE:

UNIT I : INTRODUCTION Artificial neural network: Introduction, Fundamental concepts – Evolution of neural networks- basic models – important terminologies – McCulloch-Pitts neuron – linear separability – hebb network – supervised learning network: perceptron networks – adaptive linear neuron, multiple adaptive linear neuron, BPN, RBF, Time Delay Neural Networks.applications**9 Hrs**

UNIT II: ASSOCIATIVE NEURAL NETWORKS Associative memory network: auto-associative memory network, hetero-associative memory network, BAM, hopfield networks, iterative autoassociative memory network & iterative associative memory network – Temporal Associative Memory Network**.** **9 Hrs**

UNIT III:UNSUPERVISED LEARNING NETWORKS: Kohonenself organizing feature maps, LVQ – Counterpropagation Networks - ART network- Boltzmann Machine**9 Hrs**

UNIT IV : FUZZY LOGIC : Introduction – Classical sets-Fuzzy sets-cartesian product of Relation-Classical Relation-Fuzzy Relations-Membership functions: features, fuzzification, methods of membership value assignments-Defuzzification: lambda cuts – methods – fuzzy arithmetic and fuzzy measures: fuzzy arithmetic – extension principle – fuzzy measures – measures of fuzziness -fuzzy integrals – fuzzy rule base and approximate reasoning : truth values and tables, fuzzy propositions, formation of rules-decomposition of rules, aggregation of fuzzy rules, fuzzy reasoning**9 Hrs**

UNIT V : GENETIC ALGORITHM: Genetic algorithm and search space – general genetic algorithm – operators –Hybrid Soft Computing Techniques-Neuro-fuzzy hybrid systems –– Applications of soft computing:A fusion approach of multispectral images with SAR, optimization of traveling salesman problem using genetic algorithm approach, **9 Hrs**

BOOKS FOR REFERENCES:

1. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.
2. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education 2004.

3. S.Rajasekaran and G.A.VijayalakshmiPai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations Applications" Prentice Hall, 1997.
4. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning" Pearson Education India, 2013.
5. James A. Freeman, David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
6. Simon Haykin, "Neural Networks Comprehensive Foundation" Second Edition, Pearson Education, 2005.

E-LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105173/

2. http://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	To learn about the structure of neuron – biological background – traditional optimization and search techniques – Genetic basic concepts
CO 2	To understand the different types of associative neural networks
CO 3	To learn about the unsupervised learning networks
CO 4	To learn about – Classical sets-Fuzzy sets-cartesian product of Relation-Classical Relation-Fuzzy Relations
CO 5	To learn about genetic algorithm and search space

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	2	3
CO 2	3	3	2	2	2
CO 3	2	2	3	2	2
CO 4	2	3	3	3	2
CO 5	3	2	2	3	3
Average	2.6	2.4	2.4	2.4	2.4

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Realization of Tools, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
COMPUTER LABORATORY-V: XML AND WEB SERVICES

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/3P5/XWS**
CREDITS : 2 **L-T-P : 0-0-5**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Learn real world problems extensively.
2. Understanding CSS creation and implementation.
3. Identify new application requirements in the field of XML
4. Make use of Data in XSLT format.

COURSE OUTCOMES:

CO No.	CO Statements
CO1	Working with external ,internal DTD,CSS
CO2	Implementing basic XSLT tabulation

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	3	3
CO 2	2	2	2	3	3
Average	**2**	**2**	**2**	**3**	**3**

1. Validate XML document using DTD
2. Usage of simple schema.
3. Usage of complex schema.
4. To format and display data using CSS.
5. To format and display data using XSL sorting
6. To format and display data using tabular format.
7. A web service program for temperature conversion.
8. A web service program for concurrency conversion.
9. Database connectivity using SQL server.

SEMESTER III
COMPUTER LABORATORY-VI: MACHINE LEARNING

TOTAL HOURS : 45 Hrs **COURSE CODE : MCA20/3P6/MLG**
CREDITS : 2 **L-T-P : 0-0-5**

COURSE OBJECTIVES:

To enable the post graduate students to

1.Learn real world problems extensively.
2.Understand ML algorithms and implement.
3. Identify new application requirements in the field of computer vision.
4.Make use of Data sets in implementing the machine learning algorithms.

COURSE OUTCOMES:

CO No.	CO Statements
CO1	Working with machine learning tools
CO2	Implement basic machine learning concepts

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	3	3
CO 2	2	2	2	3	3
Average	**2**	**2**	**2**	**3**	**3**

LIST OF EXPERMENTS:

1. Working with Data in OpenCV and Python

a) Loading External Dataset in Python.(Raw text, CSV, JSON, XML, Spreadsheets, and Images.

b) Visualizing the data using Matplotlib.

2. Working with Decision Trees and the Visualization

a) Bank Loan Analysis.

b) Diagnosisof breast cancer.

3. Working with Data and Engineering Features

a) Implementing PCA in OpenCV
b) NLP working with bag of words
c) Extracting Features using SIFT and ORB.

4. Working with clustering

a) Classify the handwritten digits using K-means.
b) Weather Data Classification

5. Working with Classification

a) Classify your own dataset using SVM.
b) Classify your own dataset using KNN.
c) Bayesian Classification

E-LEARNING RESOURCES:

1 https://docs.opencv.org/2.4/doc/tutorials/tutorials.html

2 https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_tutorials.html

3 https://docs.opencv.org/3.0-beta/doc/py_tutorials/py_ml/py_knn/py_knn_index.html

4 https://www.bogotobogo.com/python/OpenCV_Python/python_opencv3_Machine_Learning_Classification_K-nearest_neighbors_k-NN.php

5 https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_ml/py_svm/py_svm_basics/py_svm_basics.html

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Hands on session.

QUESTION PAPER PATTERN:

Knowledge Level	Section-A	Marks	Total
K2, K3 (UNDERSTANDING & APPLYING)	1 Question	30	60
K3, K4 (APPLYING & ANALYSING)	1 Question	30	

SEMESTER III
COMPUTER LABORATORY-VII: MINI PROJECT

TOTAL HOURS:45Hrs **COURSE CODE: MCA20/3P7/MPT**
CREDITS: 2 **L-T-P: 0-0-5**

Students have to develop a Mini Project in their area of interest using latest technology and tools.

SEMESTER III
COMPUTER LABORATORY-VIII: INTERNSHIP

TOTAL HOURS:45Hrs **COURSE CODE: MCA20/3P8/INP**
CREDITS :2 **L-T-P: 0-0-5**

Students have to undergo internship in reputed industries for the period of 6 to 8 weeks during summer vacation

ELECTIVES

SEMESTER I
SOFTWARE ENGINEERING

TOTAL HOURS: 45Hrs **COURSE CODE: MCA20/1E1/SEG**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVE:

To enable the post graduate students to

1. Provide information about software engineering issues involves in the development of complex, evolving (software-intensive)systems.
2. Understand the software development lifecycle models
3. Familiarize the basic concepts of software design and implementation.
4. Perform software testing on various applications.
5. Apply various software metrics on software products improve the quality

COURSE OUTLINE:

UNIT I : A Generic View of Process – Process Models-The Waterfall Model- Incremental Model-Evolutionary Model-Specialized Model-The Unified Process–Agile Process – Agile Models – Software Cost Estimation – Planning – Risk Analysis – Software Project Scheduling**.** **9Hrs**

UNIT II : System Engineering Hierarchy – System Modeling – Requirements Engineering: Tasks- Initiating the Process-Eliciting Requirements-Developing Use Case - Negotiating Requirements-Validating Requirements **9Hrs**

UNIT III : Building the Analysis Models: Concepts. Design Concepts – Design Models – Pattern Based Design – Architectural Design – Class Based and Conventional Components Design – User Interface Design **9Hrs**

UNIT IV : Software Testing – Strategies: Conventional - Object Oriented – Validation Testing – Criteria – Alpha – Beta Testing- System Testing – Recovery – Security – Stress – Performance - Testing Tactics – Testing Fundamentals-Black Box – While Box – Basis Path-Control Structure. **9Hrs**

UNIT V : Software Configuration And Management-Features-SCM Process - Software Quality Concepts – Quality Assurance – Software Review–Technical Reviews – Formal Approach To Software Quality Assurance – Reliability – Quality Standards – Software Quality Assurance Plan. **9Hrs**

RECOMMENDED TEXTBOOKS:

1. Ian Sommerville, "Software Engineering", Tenth Edition, Pearson, 2015.
2. Roger S Pressman, Software Engineering: A practitioner's approach, McGraw-Hill Education, 8thEdition

REFERENCE BOOKS:

1. Ali Behforroz, Frederick J.Hudson,Software Engineering Fundamentals, Oxford Indian Reprint,2012.
2. Jibitesh Mishra, Ashok Mohanty, Software Engineering, Pearson Education, First Edition, 2011.
3. PankajJalote,An Integrated approach to Software Engineering,,Third Edition, Narosa Publications, 2011

JOURNALS:

1. https://www.journals.elsevier.com/advances-in-engineering-software
2. https://jserd.springeropen.com/

E-LEARNING RESOURCES:

1 .https://www.udemy.com/course/sdlc-models/
2 .https://www.edx.org/learn/project-management
3. https://www.edx.org/micromasters/software-development
4. https://www.edx.org/course/software-testing-fundamentals-usmx-umuc-stv1
5. https://www.coursera.org/courses?query=quality%20management

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Understand the SDLC process models
CO 2	Able to understand the functions of requirements engineering and SRS
CO 3	Able to design models and various designs of software development
CO 4	Understand the concept of testing in software and importance
CO 5	Able to understand software quality concepts

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO5
CO 1	3	2	2	2	3
CO 2	3	3	2	2	2
CO 3	2	2	3	2	2
CO 4	2	3	3	3	2
CO 5	3	2	2	3	3
Average	2.6	2.4	2.4	2.4	2.4

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, learning through Demonstrations, LCD Projectors, e-content, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER I
COMPUTER NETWORKS

TOTAL HOURS: 45Hrs **COURSE CODE: MCA20/1E1/CNS**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Develop knowledge over the basics of Networks and Physical layer.
2. Recognize the functionality of various protocols in Data link layer.
3. Analyze the steps involved in algorithms belong to Network layer.
4. Know the significance of services offered by the Transport layer.
5. Understand the real time end-user applications.

COURSE OUTLINE:

UNIT I: Introduction: The uses of Computer Networks - Network Hardware - Reference Models - Example of Networks. The Physical Layer: Guided Transmission Media - Wireless Transmission – Public Switched Telephone Network - Mobile telephone System.

9Hrs

UNIT II: The Data Link Layer: Data link layer design issues - Error detection and correction - Elementary Data Link Protocols - Sliding Window Protocols - Example of data Link Protocols- ETHERNET – 802.11 – Bluetooth.

9 Hrs

UNIT III: The Network Layer: Network Layer Design Issues - Routing Algorithms - Congestion Control Algorithms - Internetworking- Network layer in the Internet.

9 Hrs

UNIT IV: The Transport Layer: Transport Service - Transport Protocols – Simple Transport Protocol - Internet Transport protocols: UDP, TCP.

9 Hrs

UNIT V: The Application Layer: Domain Name System - Electronic mail - World Wide Web – Multimedia - Communication Security.

9 Hrs

RECOMMENDED TEXTBOOKS:

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, Fifth Edition, Pearson Education 2012.
2. Behrouz A. Forouzan and FirouzMosharraf, “Data Communications and Networking”, McGraw Hill, Special Indian Edition 2012.

REFERENCE BOOKS:

1. William Stallings, Data and Computer Communications, Sixth Edition, PHI, 2013.

JOURNALS:

1. https://www.springer.com/gp/all-titles-in-computer-networks/9850852
2. http://www.sciepub.com/journal/JCN

E-LEARNING RESOURCES:

1	http://iips.icci.edu.iq/images/exam/Computer-Networks---A-Tanenbaum---5th-edition.pdf
2	https://www.oreilly.com/library/view/computer-networks-fifth/9780133485936/
3	http://elearning.ascollegelive.net/studyMaterial/bca/bca_3rd_year/Networking
4	http://www.vssut.ac.in/lecture_notes/lecture1428550521.pdf
5	http://164.100.133.129:81/econtent/Uploads/Computer_Networks_Data_Communication.pdf

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Extend adequate study over the basics of Network Hardware, Software and entities present in Physical layer.
CO 2	Compare the functionality among various protocols associated with the Data link layer.
CO 3	Design and Develop the algorithms to address the Routing and Congestion control.
CO 4	Evaluate the protocols responsible for the Transport layer services.
CO 5	Learn the technical implementations wrapped-up in the services offered by Application layer.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	2	2
CO 2	3	2	2	2	2
CO 3	3	2	2	3	2
CO 4	3	2	2	2	2
CO 5	2	2	2	3	3
Average	**2.8**	**2**	**2**	**2.8**	**2.2**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, learning through Demonstrations, LCD Projectors, e-content, Realization of algorithms, Group Discussion, Assignment, Quiz, Peer Learning and Seminar and field visit.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER I
OPERATING SYSTEMS

TOTAL HOURS: 45Hrs **COURSE CODE: MCA20/1E1/OSS**
CREDITS: 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Be aware the fundamental principles of processes and operating system and their communication
2. Comprehend the various functions of process management
3. Comprehend the deadlock and memory management
4. Know about the file management and file system
5. Learn the I/O management

COURSE OUTLINE:

UNIT I : Introduction**:** Definition of OS-Mainframe System-Desktop Systems-Multi processor System-Distributed-Clustered-Real time Systems-Handheld Systems-Operating System Structure-System Components-Services-System Calls-System Programs – System Design and Implementation **9Hrs**

UNIT II : Process Management**:** Concepts-Process Scheduling-Operations on Processes-Co-operating Processes-Inter Process Communication-CPU Scheduling-Scheduling Concepts-Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling.**9Hrs**

UNIT III : Process Synchronization**:** Critical Section-Synchronization Hardware-Semaphores-Problems of Synchronization-Critical Regions-Monitors-Deadlocks-Characterization -Handling Deadlocks - Deadlock Prevention- Avoidance-Detection-Recovery. **9Hrs**

UNIT IV : Memory Management**:** Storage Hierarchy-Storage Management Strategies-Contiguous-Non Contiguous Storage Allocation-Single User-Fixed Partition-Variable Partition-Swapping-Virtual Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging-Segmentation-Page Replacement Methods-Locality-Working Sets.**9Hrs**

UNIT V : I/O And File Systems**:** Disk Scheduling-File Concepts-File System Structure-Access Methods-Directory Structure-Protection-Directory Implementation-Allocation Methods -Free Space Management Case Study: Linux Operating System – Commands, Shell Programming. **9Hrs**

RECOMMENDED TEXTBOOKS:

1.AbrahamSilberschatz and Peter Galvin ,Operating System Concepts, Wiley; 8th Revised edition

2.William Stallings ,Operating Systems: Internals and Design Principles,Pearson Education; 2019 edition .

REFERENCE BOOKS:

1. D M Dhamdhere ,Operating Systems: A Concept-Based Approach" McGraw Hill Education, 3rdEdition,2017
2.AndrewS.Tanenbaum, Modern operating Systems, PHI Learning Pvt.Ltd,2016
3. Gary J Nutt,Operating Systems: A Modern Perspective, Addison-Wesley Pub

JOURNALS:

1. http://stmjournals.com/Journal-of-Operating-Systems-development-and-Trends
2. https://www.elsevier.com/catalog/computer-science/software/operating-systems

E-LEARNING RESOURCES:

1. https://www.coursera.org/courses?query=operating%20system
2. https://www.udacity.com/course/introduction-to-operating-systems--ud923#
3. https://www.coursera.org/lecture/technical-support-fundamentals/memory-management-CKcxg
4. https://www.coursera.org/lecture/technical-support-fundamentals/files-and-file-systems-5n8dt
5. https://www.coursera.org/lecture/technical-support-fundamentals/files-and-file-systems-5n8dt

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Understand the operating system components and its services
CO 2	Able to demonstrate the functions of process management and issues
CO 3	Able to synchronize and deadlock among processes
CO 4	Apply memory management concepts in OS
CO 5	Able to understand the file system recent OS

MAPPING- CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO4	PSO5
CO 1	3	2	2	2	3
CO 2	3	3	2	2	2
CO 3	2	2	3	2	2
CO 4	2	3	3	3	2
CO 5	3	2	2	3	3
Average	2.6	2.4	2.4	2.4	2.4

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY

Lecture by chalk and talk, learning through Demonstrations, LCD Projectors, e-content, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II
MOBILE COMPUTING

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/2E2/MCG**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Inspect the basics of wireless communication standards.
2. Discern the primary aspects of the Telecommunication Systems.
3. Study the Satellite systems and Wireless LAN.
4. Distinguish the importance of the Mobile Network Layer and its protocols.
5. Realize the variants of TCP and WAP.

COURSE OUTLINE:

UNIT I: Introduction: Wireless transmission–Frequencies for radio transmission–Signals – Antennas–Signal Propagation–Multiplexing–Modulations–Spread spectrum – DHSS - FHSS –Medium Access Control –SDMA–FDMA–TDMA – Fixed TDM – Classical Aloha – Slotted Aloha – CDMA – Comparative Study. **9 Hrs**

UNIT II: Telecommunication Systems:GSM– Mobile Services - System Architecture – Protocols – Localization and Calling –Hand over – Security – New Data Services - Case Study: DECT and TETRA. **9 Hrs**

UNIT III: Satellite Systems:- Applications – GEO-LEO-MEO- Wireless LAN–IEEE802.11 – System Architecture – HIPERLAN – WATM – BlueTooth – Architecture – Security.**9 Hrs**

UNIT IV: Mobile Network Layer: Mobile IP–Dynamic Host Configuration Protocol– MANET –Routing – DSDV – DSR **9 Hrs**

UNIT V: Mobile Transport Layer and Mobility Support: Traditional TCP – Indirect TCP–Snooping TCP – Mobile TCP–Fast Retransmit / Fast Recovery –Transmission/ Timeout Freezing -Selective Retransmission–Transaction Oriented TCP– WAP – WAP Architecture – WML Script– WAP 2.0. **9 Hrs**

RECOMMENDED TEXTBOOKS:

1. JochenSchiller,"Mobile Communications", Pearson Education, 2017.
2. William Stallings, "Wireless Communications &Networks", Pearson Education, 2014.

REFERENCE BOOKS:

1. AsokeTalukder, Hasa Ahmed and Roopa R Yavagal, "Mobile Computing", Tata McGraw Hill Edition, 2013.

2. KavehPahlavan, PrasanthKrishnamoorthy,"Principles of Wireless Networks", second Edition, 2003,PearsonEducation.

JOURNALS:

1. https://www.inderscience.com/jhome.php?jcode=ijmc
2. https://link.springer.com/journal/11277

E-LEARNING RESOURCES:

1 http://ee.sharif.edu/~pr.wireless.comm/references/Schwartz.pdf

2 https://www.bharathuniv.ac.in/colleges1/downloads/courseware_ece/notes/BEC703%20%20-CELLULAR%20MOBILE%20COMMUNICATION.pdf

3 https://web.fe.up.pt/~mleitao/CMOV/Teoricas/CMOV_GSM.pdf

4 http://ee.sharif.edu/~pr.wireless.comm/references/Goldsmith.pdf

5 http://www.cse.iitd.ernet.in/~pkalra/OLD-COURSES/siv864-2010/session-08-12.pdf

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Study over the basics of telecommunication systems.
CO 2	Compose the functionality and operational architecture of GSM, DECT and TETRA.
CO 3	Examine the variants of Wireless LAN technologies and learn about Satellite systems.
CO 4	Develop the insight into the Mobile Network Layer and the Routing algorithms.
CO 5	Relate the coordination among the types of TCP and Discuss the WAP and WML script

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	2	3
CO 2	3	3	2	3	3
CO 3	2	2	2	3	3
CO 4	3	2	2	3	2
CO 5	3	3	2	3	3
Average	**2.8**	**2.4**	**2**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Understanding of Mobile Communication Standards, Group Discussion, Assignment, Quiz, Peer Learning and Seminar and field visit.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II
CLOUD COMPUTING

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/2E2/CCG**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:
To enable the post graduate students to

1. This course provides a comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.
2. This Course Provides introduction and research to the state-of-the-art in Cloud Computing fundamental issues, Research technologies, applications and implementations.

COURSE OUTLINE:

UNIT I: Cloud Computing: Introduction – Components of Cloud – Cloud Types – Impact of Cloud Computing on Businesses **9 Hrs**

UNIT II:Virtualization: Introduction – Benefits – Virtualization Structure – Virtualization mechanism – Virtualization of CPU, Memory and I/O Devices **9 Hrs**

UNIT III: Types of Cloud Services: Software as a Service - Platform as a Service - Infrastructure as a Service – Database as a Service – Specialized Cloud Services. **9 Hrs**

UNIT IV: Cloud Types and Models: Private Cloud – Community Cloud – Public cloud – Case Study – Hybrid clouds – Comparisons **9 Hrs**

UNIT V: SLA with Cloud Service Providers: Concept of SLA – SLA Aspects and Requirements – Service Availability – Sample – Amazon S3 SLA, Google Apps SLA – Regulations for Clouds – PCI-DSS, ECPA **9 Hrs**

RECOMMENDED TEXTBOOKS:

1. KailashJayaswal, Jagannath, Donald J. Houde, Deven Shah, “Cloud Computing – Black Book”, Dreamtech Press, 2015.
2. Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, “Cloud Computing –A Practical approach”, Tata McGraw Hill Education Pvt. Ltd, 2013.

REFERENCE BOOKS:

1. RajkumarBuyya, James Broberg, AndrzejGoscinski, “Cloud Computing – Principles and Paradigms”, Wiley Publications, 2014.
2. Michael Miller, “Cloud Computing – Web-Based Applications that change the way you work and Collaborate Online”, Pearson Education, 2013.

JOURNALS:

1. https://journalofcloudcomputing.springeropen.com/
2. https://www.inderscience.com/jhome.php?jcode=ijcc
3. https://link.springer.com/journal/13677
4. http://www.imanagerpublications.com/journalsfulldetails/23/JournalonCloudComputing

E-LEARNING RESOURCES:

1.https://nptel.ac.in/courses/106105167/
2.https://www.udemy.com/topic/virtualization/
3.https://www.edx.org/school/aws
4.https://aws.amazon.com/types-of-cloud-computing/
5.https://www.esds.co.in/blog/cloud-computing-types-cloud/#sthash.NdcMd32C.dpbs

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Demonstrate the different taxonomy of parallel and distributed computing
CO 2	Articulate the main concepts, key technologies, strengths and limitations of Virtualization and Cloud computing
CO 3	Compare and contrast the delivery and deployment models of cloud computing
CO 4	Analyze the core issues of cloud computing such as energy efficiency, security, privacy and interoperability
CO 5	Recognize the cloud file systems and their applications in industry. Identify problems, explain, analyze, and evaluate various cloud computing solutions

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	3
CO 2	2	3	2	3	3
CO 3	2	2	2	3	3
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CO 5	3	3	3	3	3
Average	**2.4**	**2.4**	**2.6**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Realization of security problems, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II
INTERNET OF THINGS

TOTAL HOURS : 45 Hrs **COURSE CODE : MCA20/2E2/IOT**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Learn the concepts about Internet of things.
2. Understand and implement smart systems.
3. Understand the Architectural Overview of IoT.
4. Understand the IoT Reference Architecture and Real World Design constraints.
5. Deploy the resources into business.

COURSE OUTLINE:

UNIT I : **Introduction :** Definition & Characteristics of IoT - Physical Design of IoT : Things in IoT , IoT Protocols - Logical Design of IoT : IoT Functional Blocks , IoT Communication Models , Communication APIs - IoT Enabling Technologies : Wireless Sensor Networks , Cloud Computing , Communication Protocols, Embedded Systems.

9 Hrs

UNIT II : **Programming The Microcontroller For IOT:**Basics of Sensors and actuators – examples and working principles of sensors and actuators –Arduino/Equivalent Microcontroller platform – Setting up the board -Programming for IOT – Reading from Sensors Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using Wi-Fi / Ethernet. **9 Hrs.**

UNIT III : **M2M to IOT the vision**: Local and wide area networking – Data management – Business process in IOT – Everything as a service (XaaS) – M2M and IOT analytics.

9 Hrs

UNIT IV : **Architecture Reference Model:**Introduction, Reference Model and architecture, IoT reference Model .IOT reference architecture: Functional View, Information View, Deployment and Operational View. **9 Hrs**

UNIT V : **Real-World Design Constraints:** Introduction, Technical Design constraints-Data representation and visualization, Interaction and remote control. Industrial Automation – Commercial Building Automation – Smart cities.

9 Hrs

RECOMMENDED TEXTBOOKS:

1. ArshdeepBahga, Vijay Madisetti, ―Internet of Things – A hands - on approach, Universities Press, 2015 - (Unit 1)
2. Arduino Microcontroller GuideW.Durfee, University of Minnesota ver. oct-2011for (Unit 2)
3. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014. (Unit 3,4,5).

REFERENCE BOOKS:

1. CharalamposDoukas , Building Internet of Things with the Arduino, Create space, April 2002.
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011.
3. Luigi Atzor et.al, "The Internet of Things: A survey, ", Journal on Networks, Elsevier Publications, October, 2010.
4. http://postscapes.com/
5. http://www.theinternetofthings.eu/what-is-the-internet-of-things.

JOURNALS:

1. https://www.journals.elsevier.com/internet-of-things
2. https://www.igi-global.com/journal/international-journal-hyperconnectivity-internet-things/157228
3. https://www.mdpi.com/journal/sensors

E-LEARNING RESOURCES:

1 www.me.umn.edu/courses/me2011/arduino/

2 https://www.coursera.org/learn/iot?specialization=iot

3 https://www.coursera.org/learn/raspberry-pi-platform?specialization=iot

4 https://www.guru99.com/iot-tutorial.html

5 https://nptel.ac.in/courses/106/105/106105166/

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Gain a clear understanding of the IOT and basic frame work of IOT and devices. Learn to know the IOT enabling technologies.
CO 2	Gain a clear understanding of the frame work of the various devices. Learn to connect devices with different mode.
CO 3	Gain to know the various services related to mobile and IOT . Understanding the business process in IOT.
CO 4	Understanding the various models of IOT and learn to deploy IOT models.
CO 5	Learn real world problems and make design constrains. Understand the limitations of IOT.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	2	3	2	3	3
CO 3	3	2	3	3	3
CO 4	2	2	2	3	3
CO 5	3	3	3	3	3
Average	**2.5**	**2.5**	**2.5**	**2.8**	**2.8**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
ARTIFICIAL INTELLIGENCE

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/3E3/AIE**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Learn the difference between optimal reasoning Vs human like Reasoning
2. Understand the notions of state space representation, exhaustive search, and heuristic search along with the time and space complexities.
3. Learn different knowledge representation techniques
4. Understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing
5. Implement the use of AI to solve English Communication problems

COURSE OUTLINE:

UNIT I: INTELLIGENT AGENTS AND SEARCHING METHODS
Artificial Intelligence: Introduction : What is AI; Foundations of Artificial Intelligence- History of Artificial Intelligence- The state of Art; **Intelligent Agents:** Agent and Environments- Good Behavior- The Nature of Environments-The Structure of Agents- **Problem-solving:** Problem-solving agent; searching for solution; Uniformed search strategies; **Informed Search and Exploration:** Informed search strategies; Heuristic functions- Online Search agents and unknown environment; **Constraint Satisfaction Problems:** Constraint satisfaction problems-Backtracking search for CSPs- **Adversarial search**: Games; optimal decisions in Games; Alpha-Beta pruning. **9Hrs**

UNIT II LOGIC -Logical Agents: Knowledge-based agents- The Wumpus World-Logic; propositional logic-Reasoning patterns propositional logic- Effective propositional Model checking-Agent based on propositional logic- **First-Order Logic**- Representation revisited-Syntax and semantics of first order logic-Knowledge engineering in first order logic- **Interference in First-Order Logic**-Propositional verses first-order interference; Unification and lifting-Forward Chaining-backward Chaining-Resolution **9Hrs**
.
UNIT III Knowledge Representation: Ontological engineering-Categories and object-events- Mental events and mental objects- The internet shopping world- Reasoning system for categories- Reasoning with default information- Classical Planning**: Algorithms for planning as** state-space search- Planning graphs **9 Hrs**
UNIT IV: Uncertainty: Acting under uncertainty- Interference using full joint distributions- Independence- Bayes's rule and its use-**Probabilistic Reasoning:** Representing knowledge in an uncertain domain-The semantic of Bayesian networks- Efficient representation of conditional distribution- Exact interference in Bayesian network **9Hrs**
UNIT V: Learning: Forms of learning**;** Inductive learning; Learning decision tree; Ensemble learning- Computational learning theory **9 Hrs**

RECOMMENDED TEXTBOOKS:

1.StuartRussel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2017.
2. Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata McGraw Hill, 3rd edition. 2013.

REFERENCE BOOKS:

1. Nils J. Nilsson, "Artificial Intelligence: A new Synthesis", Harcourt Asia Pvt. Ltd., 2000.
2. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education/PHI, 2002.

JOURNALS:

1. https://www.journals.elsevier.com/science-of-computer-programming
2. https://dl.acm.org/citation.cfm?id=576122

E-LEARNING RESOURCES:

1. https://www.springer.com/in/book/9783540167822
2. https://www.e-booksdirectory.com/listing.php?category=28
3. https://nptel.ac.in/courses/109101003/downloads/Lecture.../Lecture-19-20-21.pd
4. https://onlinecourses.nptel.ac.in/noc18_cs51
5. https://nptel.ac.in/courses/106106140

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Analyse the modern view of AI as the study of agents that receive precepts from the environment and perform actions
CO 2	Demonstrate awareness of informed search and exploration methods
CO 3	Demonstrate about AI techniques for knowledge representation, planning and uncertainty management
CO 4	Develop knowledge of decision making and learning methods
CO 5	Implement the use of AI to solve English Communication problems

MAPPING-CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	2	2	3
CO2	2	3	2	3	2
CO3	2	2	3	3	3
CO4	2	0	3	3	3
CO5	3	3	3	3	3
AVERAGE	2.4	2.2	2.6	2.8	2.8

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
DIGITAL IMAGE PROCESSING

TOTAL HOURS: 45Hrs **COURSE CODE: MCA20/3E3/DIP**
CREDITS : 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Understand the fundamentals of Digital image processing.
2. Understand the different types of Image transform techniques.
3. Understand the different types of Image enhancement techniques in spatial andfrequency domain.
4. Understand the different types of image degradation like linear image restoration techniques and nonlinear image restoration techniques.
5. Understand the image compression like lossy and lossless image compressiontechniques and also understand the need of image segmentation.

COURSE OUTLINE:

UNIT I: Digital Image Fundamentals: Fundamental Steps in Digital Image Processing, Components of an Image Processing System, A Simple Image Formation Model, Image Sampling and Quantization, Relationships Between Pixels, Imaging Geometry. **9Hrs**

UNIT II: : Image Transforms: 2-D Fourier Transform, Properties, FFT, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar transform, Slant transform. **9 Hrs**

UNIT III: Image Enhancement Spatial Domain: Introduction, Gray Level Transformations, Histogram Processing, Arithmetic and Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.- **Frequency Domain**: Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering. **9Hrs**

UNIT IV: Image Restoration and Color Image Processing: Image Restoration - Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filters-**Color Image Processing:** Pseudo-color Image Processing, Full-color Image Processing. **9 Hrs**

UNIT V: Image Compression and Segmentation -Image Compression: Fundamentals, Image Compression Models, Elements of information Theory, Error Free Compression, Lossy Compression- **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds **9Hrs**
.

RECOMMENDED TEXTBOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing , Pearson Prentice Hall,Third Edition,2013.
2. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, Digital Image Processing Using MATLAB, McGraw Hill Education (India) Private Limited., 2014.

REFERENCE BOOKS:

1. A. K. Jain, "Fundamentals of Digital Image processing", Prentice Hall of India, New Delhi, 2nd Edition, 1997.
2. Rafael C. Gonzalez, "Digital Image processing using MATLAB", Richard E. Woods and Steven Low price Edition, Pearson Education Asia, India, 2nd Edition, 2004.
3. William K. Pratt, "Digital Image Processing", John Wiley & Sons, New Delhi, India, 3rd edition, 2004.
4. Arthur R. Weeks, "Fundamentals of Electronic Image Processing", SPIE Optical Engineering Press, New Delhi, India, 2nd Edition, 1996.

JOURNALS:

1. www.ciitresearch.org/dip.html
2. https://link.springer.com/journal/10278
3. https://sites.google.com/site/ijcsis/digital-image-processing

E-LEARNING RESOURCES

1. https://www.coursera.org/learn/digital
2. https://ufonline.ufl.edu/courses/gis4037-digital-image-processing/
3. http://www.eucourses.eu/en/courses-available/digital-extra
4. https://www.online.colostate.edu/courses/ECE/ECE513.dot
5. https://alison.com/tag/digital-image-editing

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Discuss the fundamentals of Digital image processing including the simple image formation and relationship between pixels
CO 2	Analyze the different types of Image transform techniques
CO 3	Outline the different types of Image enhancement techniques in spatial and frequency domain
CO 4	Understand the different types of image degradation like linear image restoration techniques and nonlinear image restoration techniques
CO 5	Apply the image compression like lossy and loss less image compression techniques and also understand the need of image segmentation

MAPPING-CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	3
CO2	3	2	3	2	3
CO3	3	1	3	2	3
CO4	3	1	3	3	3
CO5	3	3	3	3	3
AVERAGE	3	1.8	3	2.4	3

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
VIRTUAL & AUGMENTED REALITY

TOTAL HOURS: 45hrs **COURSE CODE: MCA20/3E3/VAR**
CREDITS: 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students

1. To learn the features associated with Virtual Reality.
2. To realize various models of I/O interfaces.
3. To understand the techniques involved in computer graphics.
4. To analyze various types of interactive techniques in Virtual Reality.
5. To study the basics of Augmented and Mixed Reality.

COURSE OUTLINE:

UNIT I: Introduction of Virtual Reality: Fundamental Concept and Components of Virtual Reality - Primary Features and Present Development on Virtual Reality. **9 hrs**

UNIT II: Multiple Models of Input and Output Interface in Virtual Reality: Input – Tracker - Sensor - Digital Glove - Movement Capture - Video-based Input - 3D Menus & 3DScanner - Output - Visual /Auditory / Haptic Devices. **9 hrs**

UNIT III:Visual Computation in Virtual Reality: Fundamentals of Computer Graphics - Software and Hardware Technology on Stereoscopic Display - Advanced Techniques in CG - Management of Large Scale Environments & Real Time Rendering. **9 hrs**

UNIT IV: Interactive Techniques in Virtual Reality: Body Track - Hand Gesture - 3D Manus - Object Grasp - Application of VR in Digital Entertainment - VR Technology in Film & TV Production - VR Technology in Physical Exercises and Games. **9 hrs**

UNIT V: Augmented and Mixed Reality: Taxonomy -Technology and features of augmented reality -Difference between AR and VR - Challenges with AR - AR systems and functionality - Augmented reality methods -Visualization techniques for augmented reality - Wireless displays in educational augmented reality applications -Mobile projection interfaces –Marker-less tracking for augmented reality -Enhancing interactivity in AR environments - Evaluating AR systems. **9 hrs**

RECOMMENDED TEXTBOOKS:

1.Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press,2013/2016.
2.Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann,2018.

REFERENCE BOOKS:

3.Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
4.Jason Jerald, The VR Book, Human Centered Design for Virtual Reality, ACM Books #8, 2016.

JOURNALS:

1.https://www.pdfdrive.com/virtual-augmented-and-mixed-reality-applications-of-virtual-and-augmented-reality-6th-international-conference-vamr-2014-held-as-part-of-hci-international-2014-heraklion-crete-greece-june-22-27-2014-proceedings-part-ii-d174602044.html
2.https://www.researchgate.net/publication/322917542_Augmented_Reality_Textbook_for_Future_Blended_Education

E-LEARNING RESOURCES:

1. http://www.morganclaypoolpublishers.com/catalog_Orig/samples/9781970001136_sample.pdf
2. file:///C:/Users/Admin/Downloads/628401.pdf
3. https://www.britannica.com/technology/Augmented Reality
4. https://www.scribd.com/doc/45720966/Augmented and Mixed Reality

COURSE OUTCOMES:

CO No.	CO Statement	Knowledge Level
CO 1	Knowledge over the features associated with Virtual Reality.	K1
CO 2	Insight into the I/O interface of Virtual Reality.	K1, K2
CO 3	Understand about computer graphics and real time rendering.	K2, K3
CO 4	Learn about interactive techniques in VR.	K2
CO 5	Acquire the information on AR and Mixed Reality.	K3, K4

MAPPING-CO with PO

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	3	2	2	2	2	3	2	2
CO 2	3	3	3	3	2	3	2	2	3	3
CO 3	3	3	3	2	2	2	2	3	3	2
CO 4	3	3	2	2	2	2	3	2	3	2
CO 5	2	3	2	3	2	3	3	3	2	3
Average	**2.6**	**2.8**	**2.6**	**2.4**	**2**	**2.4**	**2.4**	**2.6**	**2.6**	**2.4**

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3
CO 1	2	2	2
CO 2	3	3	2
CO 3	3	3	3
CO 4	2	3	3
CO 5	3	3	2
Average	**2.6**	**2.8**	**2.4**

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
ROBOTICS

TOTAL HOURS: 45hrs **COURSE CODE: MCA20/3E4/RTS**
CREDITS: 3 **L-T-P :3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

- describe the different physical forms of robot architectures using PIC.
- analyze manipulation and navigation problems using EPIC programming board.
- considercoding, compiling and testing the programmed Microchip.
- perform stability analysis of a paper based robotics study.
- model uncertainty in building Dash robotic bug processes.

COURSE OUTLINE:

UNIT I: Robot Intelligence: Microcontroller – The Compiler – PIC Programming Overview – EPIC Programmer – Firmware – Consumables – 16F84 PIC Microcontroller – Installing the Compiler. **9 hrs**

UNIT II: Installation: Installing the Compiler – Installing the EPIC Software – Code Designer – Features – Software Installation – Setting Code Designer options – EPIC Programming Board Software – Parts List. **9 hrs**

UNIT III: Using DOS – To code, compile and Program- Programming the Microchip – Using Epic DOS version – Continuing with the wink.bas program – Testing the PIC Microcontroller.**9 hrs**

UNITIV:Robots made from interesting materials – Make Actuated Paper – Case study: Self-folding sheets – Jie Qi's Moving paper sculpture. **9 hrs**

UNIT V: Building Robots: Case Study – Dash Robotic bug – Making the Project – Project parameters – Directions for building Dash Robotic bug – Circuit Basics. **9 hrs**

RECOMMENDED TEXTBOOKS:

1. John Iovine, A Beginner's guide to Robotics Project using the PICmicro, Tata McGraw Hill, Sixth Edition 2014.
2. KatheCeceri, Making Simple Robotics, Makermedia, Safari books online,SanFrancisco, CA, 2015.

REFERENCE BOOKS:

1.Kevin M. Lynch and Frank C. Park, Modern Robotics: Mechanics, Planning, and Control, Cambridge University Press, 2017.
2.Alonzo Kelly, *Mobile Robotics: Mathematics, Models, and Methods*, Cambridge University Press, 2016.

JOURNALS:

1. https://digital-library.theiet.org/content/journals/iet-cdt
2.https://www.researchgate.net/publication/3114676_Robotics_for_Engineers

E-LEARNING RESOURCES:

1. http://www.robot.bmstu.ru/files/books/(Ebook%20-%20English)%20Mcgraw-Hil,%20Pic%20Robotics%20--%20A%20Beginner'S%20Guide%20To%20Robotic.pdf
2. https://www.ncertbooks.guru/robotics-engineering/
3. https://www.springer.com/gp/book/9781461598909
4. https://doc.lagout.org/science/0_Computer%20Science/8_Electronics%20%26%20Robotics/Robotics%20and%20Automation%20Handbook.pdf

COURSE OUTCOMES:

CO No.	CO Statement	Knowledge Level
CO 1	Exposure over the basics of Robotics Design.	K1
CO 2	Insight into the installation of Compiler and EPIC programming.	K1, K2
CO 3	Usage of DOS for programming Microchip.	K2, K3
CO 4	Create Robots with interesting materials.	K2
CO 5	Build robots with project development basics.	K3, K4

MAPPING-CO with PO

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	2	3	2	2	2	2	3	2	2
CO 2	3	3	3	2	2	3	2	2	3	2
CO 3	3	3	3	2	2	2	2	3	3	2
CO 4	3	3	2	2	2	2	3	2	3	2
CO 5	2	3	2	2	2	3	3	3	2	2
Average	**2.6**	**2.8**	**2.6**	**2**	**2**	**2.4**	**2.4**	**2.6**	**2.6**	**2**

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3
CO 1	2	2	2
CO 2	3	3	2
CO 3	3	2	3
CO 4	3	3	3
CO 5	3	2	2
Average	**2.8**	**2.4**	**2.4**

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
BIG DATA ANALYTICS

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/3E4/BDA**
CREDITS: 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1 Concepts To explore the fundamentals of big data analytics , Intelligent analysis and various tools for analysis and reporting
2 Learn to analyze various big data streams and how to process the different types of streams.
3 Understand Hadoop platform and Map-reduce and able to explore how to implement them
4 Learn to use hadoop clusters and how hadoop is implemented in the cloud
5 Understand the applications of Pig and Hive , the database for hadoopHbase and the various analysis and interaction techniques

COURSE OUTLINE:

UNIT I: **Introduction to Big Data Platform:** Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools**9 Hrs**

UNIT II: **Introduction To Streams Concepts:** Stream Data Model and Architecture - Stream Computing -Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. **9 Hrs**

UNIT III: **History of Hadoop:** The Hadoop Distributed File System – Components of Hadoop- Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFSBasics- Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce Features.
9 Hrs

UNIT IV **Setting up a Hadoop Cluster:** Cluster specification - Cluster Setup and Installation –HadoopConfiguration-Security in Hadoop - Administering Hadoop – HDFS - Monitoring-Maintenance-Hadoop benchmarks- Hadoop in the cloud.
9 Hrs

UNIT V **Applications on Big Data Using Pig and Hive:** Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques-Systems and applications. **9 Hrs**

RECOMMENDED TEXTBOOKS:

1 Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2 Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3 Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding
BigData: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
4 AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5 Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith Advanced Analytics", JohnWiley& sons, 2012.
6 Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007

REFERENCE BOOKS:

1 Nathan Marz, , James Warren "Big Data: Principles and best practices of scalable realtime data systems" 1st Edition , Manning Publications, 2015
2 Martin Klepmann, "Designing Data-Intensive Applications: The Big Ideas Behind Reliable,Scalable, and Maintainable Systems" , First Edition, O'Reilly , 2015
3 Big Data For Dummies; 1st edition (April 15, 2013)
4 SeemaAcharya, SubhashiniChellappan , "Big Data and Analytics", Wiley Publications, 2015
5 MayankBhushan, "Big Data and Hadoop- Learn by Example", BPB publications 2018

JOURNALS:

1 https://journalofbigdata.springeropen.com/
2 https://www.journals.elsevier.com/big-data-research
3 https://link.springer.com/journal/40537
4 https://link.springer.com/journal/40537
5 https://www.scimagojr.com/journalsearch.php?q=21100791292&tip=sid&clean=0

E-LEARNING RESOURCES:

1 https://nptel.ac.in/courses/106104189/
2 https://www.coursera.org/mastertrack/big-data-asu
3 https://www.cloudera.com/products/open-source/apache-hadoop.html
4 https://hadoop.apache.org/docs/stable/
5 https://www.ibm.com › analytics › hadoop › big-data-analytics

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Demonstrate the challenge with Big Data and various modern Analytics Tools
CO 2	Interpret Big Data as stream, how to filter & analyze the stream
CO 3	Understand the Hadoop Architecture, how to run jobs, tasks
CO 4	How to develop map reduce applications.
CO 5	Experiment with Hadoop Architecture, its Applications

MAPPING-CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	1	2	1
CO2	3	2	3	2	1
CO3	2	2	3	3	3
CO4	3	2	3	3	3
CO5	2	3	2	2	3
AVERAGE	2.4	2.4	2.4	2.4	2.2

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, Presentations, MOOOCs e-Content,, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER III
DATA WAREHOUSING AND MINING

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/3E4/DWM**
CREDITS: 3 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to,

1. Explore the concept of data mining which covers the basic tasks, metrics, issues and implication. Core topics like classification, clustering and association rules are exhaustively dealt with.
2. Introduce the concept of data warehousing that covers special emphasis on architecture and design.
3. Understand various preprocessing steps and the basic concepts of data ware house modelling
4. understand various classification techniques
5. understand various clustering techniques and the research trends in data mining

COURSE OUTLINE:

UNIT I : **Introduction –** Why Data Mining? What isData Mining? What kinds of Data can be mined? What kinds of Patterns can be Mined? Technologies used- Kinds of applications targeted – major issues - Know your Data – Data Objects and Attribute Types - Basic Descriptions of Data – Data Visualization – Measuring Data Similarity and Dissimilarity **9Hrs**

UNIT II : Data Preprocessing **–** Overview- Data Cleaning – Data Integration – Data Reduction – Data Transformation and Data Discretization - Data Warehousing and Online Analytical Processing – Basic Concepts – Data Warehouse Modeling – Data Warehouse Design and Usage – Data Warehouse Implementation – Data Generalization **9 Hrs**

UNIT III : Data Cube Technology – Data Cube Computation and Methods – Exploring Cube Technology – Multidimensional Data Analysis - Mining Frequent Patterns – Basic concepts – Frequent Itemset Mining Methods – Pattern Evaluation Methods **9 Hrs**

UNIT IV : Classification - Basic concepts – Decision Tree Induction – Bayes Classification Methods – Rule Based Classification – Advanced Methods – Baysian Belief Networks – Back Propagation – Support Vector Machines

9 Hrs

UNIT V : Cluster Analysis - Partitioning methods –Advanced Cluster Analysis – Clustering High Dimensional Data – Network Data - Outlier Detection – Outlier Detection Methods – Data Mining Trends and Research Frontiers

9 Hrs

RECOMMENDED TEXTBOOKS:

1. J. Han, M. Kamber, “Data Mining: Concepts and Techniques”, Third edition ,Morgan Kauffman, 2011.
2. Margaret H.Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson

Education 2004.

3. Sam Anahory, Dennis Murry, "Data Warehousing in the real world", Pearson Education 2003.
4. David Hand, Heikki Manila, PadhraicSymth, "Principles of Data Mining", PHI 2004.
Alex Bezon, Stephen J.Smith, "Data Warehousing, Data Mining & OLAP", McGraw-Hill Edition, 2001.

E-LEARNING RESOURCES:

1. www.mhhe.com,
2.www.comp.lancs.ac.uk
3.www.ntpel.iitm.ac.in

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Demonstrate the challenge with Big Data and various modern Analytics Tools
CO 2	Interpret Big Data as stream, how to filter & analyze the stream
CO 3	Understand the Hadoop Architecture, how to run jobs, tasks
CO 4	How to develop map reduce applications.
CO 5	Experiment with Hadoop Architecture, its Applications

MAPPING-CO with PSO

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	2	3	1	2	1
CO2	3	2	3	2	1
CO3	2	2	3	3	3
CO4	3	2	3	3	3
CO5	2	3	2	2	3
AVERAGE	2.4	2.4	2.4	2.4	2.2

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, Presentations, MOOOCs e-Content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

EXTRA DISCIPLINARY COURSES

SEMESTER I
ACCOUNTING AND FINANCIAL MANAGEMENT

TOTAL HOURS: 45 Hrs **COURSE CODE: MCA20/1ED1/AFM**
CREDITS: 3 **L-T-P: 3-0-0**

COURSE OBJECTIVES:
To enable the post graduate students to

1. Study the principles of accounting.
2. Classify the analysis and interpretation of accounts.
3. Learn the break even analysis and marginal costing.
4. Extend the preparation of functional budget characteristics.
5. Understand the methods behind the project appraisal.

COURSE OUTLINE:

UNIT I: Principles of Accounting : Principles and concepts of Accounting – Journal, Ledger, Trial balance and preparation of financial statements-Trading & profit and loss accounts- Balance sheet including major adjustments(simple problems only). **9 hrs**

UNIT II: Ratio Analysis: Ratio analysis- Use of ratios in interpreting the final accounts: trading accounts and loss a/c and balance sheet - only calculation of ratio (Ratios to Construction of Financial Statements not included) **9 hrs**

UNIT III:Break Even Analysis and Marginal Costing: Meaning of variable cost and fixed cost-Cost-Volume – profit analysis-Calculation of breakeven point**9 hrs**

UNIT IV:Budget/Forecasting: Preparation of and characteristics of functional budgets-production- sales- purchases- cash and flexible budgets. **9 hrs**

UNIT V: Project Appraisal: Capital Budgeting -Payback method- ARR method-Discounted cash flows-Net present values-internal rate of return. **9 hrs**

RECOMMENDED TEXTBOOKS:

1. A.Murthy"Financial Management"MarghamPublicatio,. 2017
2. Prof T.S.Reddy&Dr.Y.HariprasaReddy,"Management Accounting", 2017

REFERENCE BOOKS:

1. T.S. Reddy and A. Murthy "Financial Accounting".
2. Kuchhal S.C. "Financial Management",chaitanya,1980.
3. Gupta R.L &M.Radhaswamy,"Advanced Accounts(Vol II)",New Delhi,S.Chand& sons,2014.

JOURNALS:

1. http://www.science.smith.edu/~jcardell/Courses/EGR328/Readings/uProc%20Ovw.pdf.
2. http://angom.myweb.cs.uwindsor.ca/teaching/cs266/Lec26601.pdf

E-LEARNING RESOURCES:

1. https://www3.risc.jku.at/education/courses/ss2002/compsys/slides/systems/slides-main.pdf.
2. https://en.wikibooks.org/wiki/IB/Group_4/Computer_Science/Computer_Organisation
3. http://pdplab.it.uom.gr/teaching/tanenbaum/2.pdf
4. https://www.elprocus.com/8085-microprocessor-architecture/
5. https://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Microprocessors%20and%20Microcontrollers/pdf/Lecture_Notes/LNm1.pdf

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Acquire the conceptual knowledge of accounting principles
CO 2	Understand the concepts and standards underlying the analysis and interpreting the accounts.
CO 3	Have the comprehensive knowledge about the break even analysis and marginal costing.
CO 4	Gain expertise in Budget and forecasting.
CO 5	Interpret the elements related to project appraisal and capital investment decision making

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	3	3	2	2	3
CO 3	3	2	2	2	3
CO 4	3	3	3	3	2
CO 5	3	2	3	3	3
Average	**2.8**	**2.4**	**2.4**	**2.4**	**2.6**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors-content, Realization of Microprocessor Instructions in Digital Trainer Kit, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

Knowledge Level	Section	Word Limit	Marks	Total
K1,K2 (REMEMBERING & UNDERSTANDING)	A – Answer ALL (10 x 2 = 20 marks) (Q.No 1- Q.No 10)	One or Two Sentences	20	100
K2, K3 (UNDERSTANDING & APPLYING)	B – Answer any FIVE out of SEVEN questions (5 x 6 = 30 marks) (Q.No 11 – Q.No 17)	250	30	
K4, K5 (ANALYSING & EVALUATING)	C – Answer any FIVE (Internal Choice) (5 x 10 = 50 marks) (Q.No 18- Q.No 22)	500	50	

SEMESTER II
STATISTICAL METHODS

Total Hours: 45 Hrs **Course Code: MCA20/2ED2/SMS**
Credits: 3 **L T P: 3-0-0**

COURSE OBJECTIVES:

To enable post graduate students

1. Demonstrate knowledge of probability and the standard statistical distributions.
2. Have a proper understanding of Statistical applications in and Management.
3. Analyze the statistical data and translate the real-world problems into probability models.
4. Providepragmatic tools for assessing statistical claims and conducting their own statistical analyses.
5. Apply Statistical formulae and functions in Algorithms and Coding.

COURSE OUTLINE:

Unit-I: Introduction to the theory of Probability: Random Experiment- Law of Addition and Multiplication – Conditional Probability– Bayes theorem – Random Variable- Probability density function and Probability mass function **(Not for Examination Purpose)Theoretical Discrete Distributions:**Binomial Distribution - Negative Binomial Distribution- Poisson Distribution-Fitting of Binomial and Poisson Distribution - Poisson Distribution as limiting case of Negative Binomial Distribution - Simple Problems
Theoretical Continuous Distributions: Normal Distribution – Fitting of Normal Distribution- Simple Problems
Book1: Volume 2 – Chapter -2 **9 Hrs**

Unit- II: :Correlation and Regression: Karl Pearson Coefficient of Correlation –-Probable Error and standard error of Correlation Coefficient- Calculation of correlation coefficient for a Bivariate Frequency Table – Rank Correlation – Concurrent deviation Method – Regression – Regression lines – Regression Equations - Regression Coefficients – Simple Problems
Book 2: Chapter -8
Book 1: Volume -I, Chapter -11 **9 Hrs**

Unit -III: Samplingand Large Sample Test: Sampling –-Methods of Enumeration- Methods of sampling- Sampling and Non sampling Errors - Objectives of Sampling – Parameter and Statistic- Sampling distribution – Standard error of a statistic-Procedure of testing of hypothesis – Test of significance of large samples- Test of significance of Single mean and Proportion – Difference of means and Difference of Proportion – Difference of Standard Deviation – Simple Problems.
Book 2: Chapter 17, Chapter 18 **9 Hrs**

Unit -IV: Small Sample Test: Student 't' Distribution - Test of significance of Single Mean and Difference of two means- Estimation of parameters- Simple Problems
Chi Distribution-Test of Goodness of fit – Test of Independence of attributes –Test for the Population variance – Simple Problems
Book 2: Chapter 18, Chapter 19 **9 Hrs**

Unit -V: F Test, Analysis of Variance :F Distribution - F test – Analysis of variance- Variance analyze in One way and Two-way Classification – Simple Problems
Experimental Designs: Randomized Block Design- Advantages of Completely randomized Block design - Latin Squares – Randomized Block Vs Latin Squares – Simple Problems
Book 2 : Chapter 20
Book 1 :Volume – II, Chapter -6 **9 Hrs**

RECOMMENDED TEXT BOOKS:

1.StatisticalMethods,Dr. S. P Gupta Sultan Chand & sons, New Delhi.
2.Statistics (Theory, Methods&Application), D C Sancheti, V K KapoorSultan Chand & sons, New Delhi.

REFERENCE BOOKS:

1. S.C Gupta and V.K. Kapoor , Fundamental of Mathematical Statistics (2014), Sultan Chand & sons, New Delhi.
2. R.S.N Pillai and V. Bagavathi , Statistics (2010),Sultan Chand & sons, New Delhi.
3. Business Statistics, J.K. Sharma, Pearson Education-2nd Edition ,2012.
4. Statistical Methods Volume I & II , N.G.Das, Tata McGraw-Hill Education India
5. Murray R. Spiegel and Larry J. Stephens , Schaum's Outline Statistics(2017), McGraw Hill Education , New York

JOURNALS:

1. The Mathematics Intelligencer
2. Mathematics News Letter
3. Journal of Mathematics and Statistics, Science Publications
4. International Journal of Mathematics and Statistics

E-Learning Resources:

1. http://www.mathforum.org
2. http://www.opensource.org
3. http://www.khanacademy.org
4. http://in.ixl.com
5. http://www.learningwave.com
6. http://www/statista.com
7. http://www.springboard.com

COURSE OUTCOMES:

Upon the Successful completion of Statistics, student will be able to :

CO NO	CO STATEMENT
CO 1	Develop problem-solving techniques needed to accurately calculate probabilities
CO 2	Calculate and interpret the correlation between two variables.Analyzethe regression model and interprets the results.
CO 3	Learn the procedure for test of hypotheses concerning a population mean when the sample size is large.
CO 4	Learn the procedure for test of hypotheses concerning a population mean when the sample size is small.
CO 5	Construct an ANOVA table for one-way, two-way classification and interpret the results
CO 6	Compare and contrast between the design of experiments.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	0	2	2	2	2
CO 2	2	3	2	2	3
CO 3	3	2	3	2	3
CO 4	2	3	3	3	2
CO 5	3	2	2	3	3
Average	**2.8**	**2.4**	**2.4**	**2.4**	**2.6**

KEY: STRONGLY CORRELATED – 3 MODERATELY CORRELATED- 2 WEAKLY CORRELATED -1 NO CORREALTION-0

TEACHING METHODOLOGY

1. Lecture (Chalk -Talk– OHP-LCD)
2. Problem Solving
3. Group Discussion
4. Peer Learning

SOFTSKILL COURSES

SEMESTER I
HUMAN VALUES AND PROFESSIONAL ETHICS

Teaching Hours: 30 hrs **COURSE CODE: MCA20/1S1/HVP**
Credit: 2 **L T P C: 3-0 -0**

COURSE OBJECTIVES:

To enable the post graduate students,

1. To see that verification on the basis of natural acceptance and experiential validation through living.
2. To See the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels.
3. To understand what is happiness, prosperity and harmony in life.

COURSE OUTLINE:

UNIT I: Course Introduction-Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for value Education-Self Exploration-What is it?-its content and process; 'Natural Acceptance' and Experiential Validation-as the mechanism for self-exploration- Continuous Happiness and Prosperity-A look at basic Human Aspirations-Right understanding, Relationship and Physical Facilities-the basic requirement for fulfillment aspirations of every human being with their correct priority-Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario-Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT II: Understanding Harmony in the Human Being-Harmony in Myself!: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'-Understanding the needs of self('I') and 'Body'-*Sukh* and *Suvidha*-Understanding the Body as an instrument of 'I' (I being the doer, seer and anjoyer)- Understanding the characteristics and activities of 'I' and harmony in 'I'-Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*: correct appraisal of Physical needs, meaning of Prospoerity in detail-Programs to ensure *Sanyam* and *Swasthya*-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT III: Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship: Understanding Harmony in the family-the basic unit of human interaction-Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure Ubhay-*tripti;Trust (Vishwas) and Respect (Samman)* as the foundational values of relationship-Understanding the meaning of Vishwas; Difference

between intention and competence-Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship-Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sahastiva*as comprehensive Human Goals-Visualizing a universal harmonious order in society-Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)-from family to world family!

UNIT IV: Understanding Harmony in the Nature and Existence – Whole existence: Understanding the harmony in the Nature-Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature-Understanding existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space-Holistic perception of harmony at all levels of existence.

UNIT V: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values-Definitiveness of Ethical Human Conduct-Basis for Humanistic Education, Humanistics Constitution and Humanistics Universal Order-Competence in professional ethics: (a) Ability to utilize the professional competence for augmenting universal human order (b) Ability to identify the scope and characteristics of people-frirndly and eco-friendly production systems (c) Ability to identify and develop appropriate technologies and management patterns for above production systems- Case studies of typical holistic technologies, management models and production systems-Strategy for transition from the present state to Universal Human Order (a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers (b) At the level of society: as mutually enriching institutions and organizations.

RECOMMENDED TEXTBOOKS:

The primary resource material for teaching this course consists of

1. The text book : R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professionalEthics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2
2. The teacher'smanual : R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professionalEthics- TecahersManual, Excel books, New Delhi, 2010.
3. A set of DVDscontaining : Video of Teachers' Orientation Program
   - PPTs of Lecturers and Practice Sessions
   - Audio-visualmateria l for use in the practice sessions

In addition, the following référence books maybefounduseful for supplementaryreading in connectionwithdifferent parts of the course :

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
3. Sussan George, 1976, How the OtherHalf Dies, PenguinPress. Reprinted 1986, 1991.
4. Ivan Illich, 1974, Energy&Equity, The Trinity Press, Worcester, and HarperCollins, USA.
5. DonellaH.Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. SubhasPalekar, 2000, How ro practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.

7. A Nagraj, 1998, JeevanVidyaekParichay, DivyaPathSansthan, Amarkantak.
8. E.F. Schumacher, 1973, Small isBeautiful : astudy of economics as if people MATTERED, Blond & Briggs, Britain.
9. A.N. Tropathy, 2003, Human Values, New Age International Publishers.

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Gain knowledge to make out how life can be made appropriate and holistic.
CO 2	Thorough understanding of life for a happy and prosperous society
CO 3	Able to practice in living with harmony with their natural acceptance most of the time
CO 4	Right understanding for interconnectedness with nature
CO 5	Understand about professional ethics for engineering and technology

TEACHING METHODOLOGY:

Lecture by chalk and talk, Learning through Demonstrations, LCD Projectors-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

SEMESTER II
BUSINESS ENGLISH COMMUNICATION

TOTAL HOURS: 30 HrsCOURSE CODE:MCA20/2S2/BCN
CREDIT : 2 L T P : 3-0-0

COURSE OBJECTIVES:

It is a skill based qualification. It gives the students the opportunity to learn practical language skills in four key areas: reading, writing, listening and speaking

COURSEOUTLINE:

	BEC Preliminary	**BEC Vantage**	**BEC Higher**
Reading	7 parts / 45 items 1 hour	5 parts / 45 items 1 hour	6 parts/2 items 1 hour
Writing	2 tasks 1 hour 50 minutes (NB reading and writing)	2 tasks 45 minutes	2 tasks 1 hour 10 minutes
Listening	4 parts/50 items about 40 minutes including transfer time	3 parts / 50 items about 40 minutes including transfer time	3 parts / 50 items about 40 minutes including transfer time
Speaking	3 parts 12 minutes	3 parts 14 minutes	3 parts 16 minutes

RECOMMENDED TEXTBOOKS:

Materials from University of Cambridge

SEMESTER II

TECHNICAL SEMINAR AND REPORT WRITING

TOTAL HOURS: 30 Hrs **COURSE CODE: MCA20/2S3/TSR**
CREDITS: 2 **L-T-P: 3-0-0**

COURSE OBJECTIVE:

To enable the post graduate students to

1. Provide a brief outline about any one field in information technology
2. Elaborate literature survey of the domain opted.
3. Reveal and apply any technique to obtain the desired output.
4. Present the paper in the review and write a technical paper.

COURSE OUTLINE:

The goal of this course is to train the students to critically evaluate a well-defined set of research subjects and to recapitulate the conclusion concisely in a paper of scientific quality. The paper will be evaluated based on the ability to understand a topic, communicate it and identify the issues. Results and Evaluation from this term paper will be presented to fellow students and a committee of faculty members of the department with the Head of the Department as the coordinator.

1. Every student selects a topic related to current trends and the same should be approved by the respective committee. This selection should have at least 5 distinct prime sources.
2. Every student must write a short analysis of the topic and present it to fellow Students and faculty (discuss the topic – expose the flaws – scrutinize the issues) Every week.
3. The faculty should assess the short review and award marks with respect to the following:
    a. Has the student analyzed – not merely quoted – the most significant portions of the major sources employed?
    b. Has the student presented original and convincing insights?
    c. Plagiarism to be checked.
4. Every student should re-submit and present the review article including issues/ Comments / conclusions which had arisen during the previous discussion.
5. Every student should submit a final paper as per project specifications along with all short review reports (at least 5 internal reviews) and corresponding evaluation comments to the concerned staff members.

6. Every student should appear for a final external review exam to defend themselves.

COURSE OUTCOMES:

1. Obtain a thorough knowledge about a particular domain.
2. Initiate the research process.
3. Expertise in the field.
4. Able to recognize the issues of any particular field.

TOPICS:

1. Information Security 2. Digital Image Processing 3. Computer Networks
   4. Cloud Computing 5. Cryptography and Network Security

SEMESTER III
QUANTITATIVE APTITUDE AND INTERVIEW SKILLS

Teaching Hours:30 Hrs **COURSE CODE: MCA20/3S4/QAI**

Credit: 2 **L T P C: 3-0-0**

OBJECTIVES:

To enable the PG students to

1. This course prepares the students in areas like Quantitative Aptitude (including Data Interpretation & Data Sufficiency), Reasoning & Logical Ability (including Non-Verbal Reasoning), English Language & Grammar,
2. To test the reasoning abilities and mental aptitude of the students.
3. Designed to test the language abilities and understanding of English grammar

COURSE OUTLINE:

Quantitative Aptitude:

- Time-Speed-Distance- Work and time
- Number system: HCF- LCM- Geometric Progression, Arithmetic progression- Arithmetic mean- Geometric mean- Harmonic mean- Median- Mode- Number Base System- BODMAS
- Geometry- (Lines- angles- Triangles- Spheres- Rectangles- Cube- Cone etc) visit tutorial
- Averages- Percentages- Partnership
- Menstruation- Allegation & Mixtures- Work- Pipes and Cisterns visit tutorial
- Simple Interest & Compound Interest
- Set Theory- Venn diagram Ratios and Proportion- Ratios- Percentages- In-equations visit tutorial
- Installment Payments- Partnership- Clocks
- Probability- Permutations & Combination visit tutorial
- Quadratic and linear equations visit tutorial
- Algebra , Profit & Loss

Reasoning:

- Critical reasoning- Visual reasoning- Assumption-Premise-Conclusion- Assertion and reasons- Statements and assumptions- identifying valid inferences - identifying Strong arguments and Weak arguments
- Statements and conclusions- Cause and Effect- Identifying Probably true- Probably false- definitely true- definitely false kind of statement- Linear arrangements- Matrix arrangements.
- Graphs can be Column graphs- Bar Graphs-gram- etc.
- Symbol Based problems- Coding and decoding- Sequencing - identifying next number in series- Puzzles- Syllogisms- Functions- Family tree - identifying relationship among group of people and etc

Interview Skills:

- **Task 1:** Preparing for the Job Interview How you should prepare for a job interview, find out about companies, overcome nerves, decide which clothes to wear, vocabulary about your hard and soft skills, What Employers Want and answering questions using the STAR technique.

- **Task 2:** Answering Interview Questions Avoiding mistakes during the interview, tips to help you answer questions effectively and confidently, understanding the importance of non-verbal communication during interviews, and the importance of intonation, Common Interview Questions.

- **Task 3:** Responding to Challenging Interview Questions Answering those challenging interview questions, being able to stand out during interviews, providing diplomatic answers to questions you would prefer had not been asked and giving yourself time to come up with an answer, and stressing key words in your replies.

- **Task 4:** Closing the Job Interview Effectively, The Mock Interview, Phone Interviews, Behavioral Interviews, Post Interview and Considering the questions that you, the interviewee should ask, or not ask, deciding what you should do, or not do at the end of the interview, and after the interview, and discovering how online interviews are similar and different to face to face interviews,Closing the Interview with Thank You Notes.

QUESTION PAPER PATTERN:

50 Objective Type questions uniformly distributed among the entire syllabus and each question carries 2 marks

SEMESTER IV
ENTREPRENEURIAL SKILL DEVELOPMENT

TOTAL HOURS: 30 HRS **COURSE CODE: MCA20/4S5/ESD**
CREDIT: 2 **L T P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to

1. Enable the students to enhance their Entrepreneurial skills
2. Develop the knowledge of Project Preparation & Marketing analysis..
3. Understand the support of Institutions and Investment Procurement

COURSE OUTLINE:

Unit I: Concept of Entrepreneurship: Entrepreneur -Entrepreneurship – Enterprises - Conceptual issue Entrepreneurship vs. Management, Entrepreneurial motivation.

Unit II: Entrepreneurs Role and Relation: Performance & Record, Role & Function of entrepreneurs in relation to the enterprise & relation to the economy, Source of business ideas, Entrepreneurial opportunities, the process of setting up a business.

Unit III: Project Preparation & Marketing analysis: Qualities of a good Entrepreneur, SWOT and Risk Analysis. Concept & application of PLC, Sales & distribution Management.Different between Small Scale & Large Scale Business, Market Survey, Method of marketing, Publicity and advertisement, Marketing Mix.

Unit IV: Institutions Support : Preparation of Project. Role of Various Schemes and Institutes for self-employment i.e. DIC, SIDA, SISI, NSIC, SIDO, Idea for financing/ non financing support agencies to familiarizes with the Policies /Programmes& procedure & the available scheme

Unit IV: Investment Procurement: Project formation, Feasibility, Legal formalities i.e., Shop Act, Estimation & Costing, Investment procedure –Loan procurement –Banking Processes.

BOOKS FOR REFERENCES

1. Buame, S, (2000) Entrepreneurial And Innovative Management, School of Administration.
2. Dwomo-Fokuo, E. (2003) Entrepreneurship Theory And Practice, Kumasi Polytechnic.
3. Hisrich,R.D., Peters, M.P. (1995) Entrepreneurship Starting, Developing And Managing A New Enterprise, 3rd edition, Richard Dirwin Inc.
4. Kuratko, D.F., hodgetts, R.M, (1992) Entrepreneurship, A Contemporary Approach, 2nd edition, the Dryden Press.
5. Entrepreneurial Development and Small Business Management" by Dr P T Vijayashree& M Alagammai.

EVALUATION PATTERN:

Students have to prepare a case study and present the essentials of the case study.
Viva voce will also be conducted. The expert will conduct the viva voce for the students and the Head of the Department will be the Coordinator.

VALUE ADDED COURSE

SEMESTER II
CYBER AWARENESS FOR WOMEN

TOTAL HOURS: 30 Hrs **COURSE CODE: MCA20/2VAC/CAW**
CREDITS : 2 **L-T-P : 3-0-0**

COURSE OBJECTIVES:

To enable the post graduate students to,

1. Release cyber awareness posters to create awareness among the women and children on cyber safety and security.
2. Encourage women and children to engage themselves in promoting cyber safety.
3. Review the existing research on the issues and dangers women and children face on the Internet.
4. Create guidelines to develop a cyber security awareness programme for women and children.

COURSE OUTLINE:

UNIT I: Introduction to Cyber Space - Introduction to Information Systems - Need for Cyber Security. **6 hrs**

UNIT II: Introduction to Cyber Attacks - Classification of Cyber Attacks - Classification of Malware Threats. **6 hrs**

UNIT III: Web Security - Email Security - Mobile Device Security - Cloud Security - IoT Security - Social Media Security. **6 hrs**

UNIT IV: Cyber Crimes - Different Types of Cyber Crimes - Scams and Frauds - Analysis of Crimes - Human Behavior. **6 hrs**

UNIT V: Cyber LawBasics - Information Technology Act 2000 -.Amendments to IT Act 2000 - Evidentiary value of Email/SMS - Cybercrimes and Offenses dealt with IPC39.**6 hrs**

BOOKS FOR REFERENCES:

1.Mary Aiken, The Cyber Effect, Random House, 2017.
2.ChristopherHadnagy, Social Engineering The Science of Human Hacking, Wiley, 2018
3.Debarati Halder, Jai Shankar, Cyber Crime and the Victimization of Women, Laws, Rights and Regulations, Information Science Reference, US, 2012.

JOURNALS:

1.https://academic.oup.com/cybersecurity
2. https://www.cybercrimejournal.com/
3. https://www.tandfonline.com/doi/abs/10.1080/08874417.2020.1712269?journalCode=ucis20

E-LEARNING RESOURCES:

1. https://ncdrc.res.in/cap.php
2. https://www.researchgate.net/publication/339273589_Cyber_Security_Awareness_Knowledge_and_Behavior_A_Comparative_Study
3. https://www.sciencedirect.com/science/article/pii/S0740624X17300540

COURSE OUTCOMES:

CO No.	CO Statements
CO 1	Gain a clear understanding of cyber space and cyber security.
CO 2	Study over cyber attacks and malware threats.
CO 3	Know about various kinds of cyber security variants.
CO 4	Understand the Crimes and Human behaviour involved in cyber space.
CO 5	Exposure over the Cyber Law basics and IT Act significance.

MAPPING-CO with PSO

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	2	2	2	2	2
CO 2	3	3	2	2	2
CO 3	3	2	3	2	3
CO 4	3	3	3	2	2
CO 5	3	2	2	3	3
Average	**2.8**	**2.4**	**2.4**	**2.2**	**2.4**

Key: Strongly Corelated-3, Moderately Corelated-2, Weakly Corelated-1, No Corelation-0

TEACHING METHODOLOGY:

Learning through Demonstrations, LCD Projectors, e-content, Group Discussion, Assignment, Quiz, Peer Learning and Seminar.

QUESTION PAPER PATTERN:

	Type of Question	Marks	Choice
PART A	Definition Multiple choice Match panel	40	**No choice** 20question x 2 mark = 40 marks
PART B	Self Awareness/ Motivation, Memory and study skills, positive thinking , General Knowledge	30	**Internal Choice** 5 questions x 6 marks = 30 marks
PART C	Application/Analysis Synthesis/Evaluation	30	**Two out of three Questions** 2 question x 15 marks = 30 marks