REGULATIONS,
SCHEME AND SYLLABUS
(2020 ADMISSION ONWARDS)

MAHATMA GANDHI UNIVERSITY
KOTTAYAM
KERALA

Board of Studies in Computer Application- P.G

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REGULATIONS FOR INTEGRATED MASTER OF COMPUTER APPLICATIONS (IMCA) PROGRAMME

AIM

The Integrated MCA programme helps students to learn advanced courses soon after Class XII studies without any gap in the academics. After completing this program, student will have the ability to pursue their career professionally with ethics and they will have sound theoretical knowledge and skill for analysing real life problems, design complex computing systems appropriate to its solutions with the recent technology. Thus the programme of the University aims at bridging the gap between the industry need and academics.

OBJECTIVE

The educational objectives of the Integrated MCA programme at Mahatma Gandhi University is to impart knowledge to students in foundation of mathematics, computer application, problem solving and decision-making technique for effective implementation in the area of software development and at the same time, be sensitive to the issues prevailing in the society.

R1. ELIGIBILITY CRITERIA

Qualifications

A candidate seeking admission to Integrated MCA course must have a pass with not less than 45% marks in 10+2 level with Mathematics / Statistics /Accountancy as compulsory subjects.

i) Subject to the regulation relating to prescribed minimum of the respective qualifying examination, the minimum marks of Admission to the Course of studies shall be 40% in the case of candidates belonging to reserved category.

ii) Candidates belonging to Socially and Educationally Backward Classes (SEBC), referred to GO(P)208/66/Edn dated. 2-5-96 and subsequent amendments to the order issued by Government. shall be given a relaxation of 3% marks in the prescribed minimum for admission and 5% for OEC.

iii) Relaxation of 5% marks from the prescribed minimum shall be allowed in the case of physically handicapped persons.

iv) Reservation of seats shall be as per rules prescribed in the relevant rules by the Directorate of Technical Education, Government of Kerala / MG University.

R2. DURATION OF THE COURSE

The Course shall extend over a period of Five Academic years consisting of Ten Semesters.

R3. PROGRAMME CO-ORDINATOR

To help the students in planning their Courses of Study and for getting general advice on academic programme, the concerned Department of the Instituition may assign a programme co-ordinator for IMCA programme under the Department. The programme co-ordinator will be the overall in charge in all matters concerning the students' work and progress.

R4. Medium of Instruction and Assessment

English

R5. Faculty under which the Degree is awarded

Faculty of Technology and Applied Sciences.

R6. CURRICULUM

The Curriculum will comprise the Courses of Study as given in the scheme in accordance with the prescribed syllabi.

Candidates will be required to undertake a suitable master's research project work and Industrial Training and mini project in consultation with the Head of the Department and the Faculty Advisor and submit the project report and industrial training report there on at the end of the respective Semesters, on dates announced by the College/Department.

R7. REQUIREMENTS OF ATTENDANCE AND PROGRESS

I. A candidate will be deemed to have completed the requirements of study of a semester and permitted to appear for each University **E**nd **S**emester **E**xaminations (ESE) only if,

   a) The candidate has kept not less than 75% of attendance of the total number of working days in each semester.

   b) He /She has a minimum of 50 % of internal assessment marks for each subject in that semester.

   c) His/her progress has been good.

   d) His/her character and conduct has been good.

II. A student who has an attendance lower than 75% in a semester will not be permitted to appear for the ESE and he/she has to redo the semester along with the regular batch at the next available opportunity. However, a candidate can repeat the course or have condonation of attendance or temporary break of study, only twice during the entire programme as per the University norms.

III. A student who has secured sessional marks lower than 50% in any course in a semester will not be permitted to appear for the ESE of that course in that semester and subsequently he/she has to redo all the internal assessments of that course with the regular batch at the next available opportunity. The sessional marks earned during repetition of course alone will be counted in such case.

IV. A Regular student who has undergone a programme of study and could not complete the programme due to shortage of attendance may rejoin the semester along with the regular batch subject to the condition that he has to undergo all the examinations of the previous semesters as per the University norms.

Note: As these are academic mandatory prerequisites no exemption will be granted in these cases whatever may be the causes.

R8. PROCEDURE FOR COMPLETING COURSE

A. The Examinations of the odd semesters will be conducted only in odd semesters and that of the even semesters only in even semesters.

B. A candidate may proceed to the course of study for the next semester only after completing the requirements of attendance and progress (Regulation clause R5) of the previous semester.

C. A candidate is eligible for condonation of shortage of attendance only twice in the entire programme subject to the conditions given below.

a. His conduct and progress must be good as certified by the Principal.

b. Condonation will be granted only on medical grounds if he/she has secured not less the 65% of attendance.

c. By the recommendation of the head of the institution, the condonation shall be granted subject to rules and procedures prescribed by the University from time to time.

d. It is open to Vice Chancellor to grant condonation of shortage of attendance on the recommendation of the head of the concerned institution.

D. A student who is not eligible for condonation of shortage of attendance shall repeat the course in full including the sessional work in the next immediate chance. The sessional marks earned during repetition of course alone will be counted in such case.

E. A student can repeat the course only once in the entire course of study only on medical reasons (hospitalization / accident / specific illness). The hospitalization must be informed by the parent in writing with the certificate obtained from the Government Medical Officer to the faculty in charge of programme coordination, Head of the Department and Principal within fifteen days of hospitalization.

F. He/She shall repeat the course work in full (including sessionals) in a particular semester/year once and within 6 consecutive semesters.

G. He/She shall not combine his course work with regular course work of any other semester.

H. He/She shall not be allowed to repeat the course work of any semester if he/she has already passed that semester examination in full.

I. A candidate who has been registered for the higher semester examination will not be allowed to repeat the course work, in lower semesters.

J. A candidate should complete up to six semesters before registering ninth semester.

R9. EXAMINATION AND VALUATION

a. Theory Examinations

There will be **e**nd **s**emester **U**niversity **e**xamination [**ESE**] at the end of each semester. There is no provision for improvement examinations.

For the smooth conduct all the theory examinations at various centres, a Chief Superintendent and an Assistant Chief Superintendent from senior faculty members are to be appointed by the Principal and approved by the University.

b. Practical Examinations

The Principals of colleges with the help of the Chairperson should arrange the practical examination for all semesters with the approval from the University.
Bonafide laboratory record / Master's project report / Industrial training/ Seminar report etc. are mandatory for appearing for the practical / viva-voce examinations.

To conduct practical examination, University will appoint an internal examiner from a panel of faculty (specialization in the relevant subject) of concerned college and an external examiner from other colleges. The external examiner will conduct the exam and decide the marks to be awarded to the candidates. The mark list filled and duly signed by the external examiner should forward to the Chairman by the external examiner. The external examiner will be the custodian of the valued answer script till the commencement of subsequent examination. There is no provision for revaluation.

c. Valuation

i) The assessment will comprise of sessional assessment and University examination in certain subjects, and wholly sessional assessments in others, carrying marks as specified in the subject of study and scheme of assessment.

ii) A candidate shall be declared to have passed in any subject in full in any semester if he/she secures not less than 50% marks in sessional, not less than 40% marks in the University Examination including Project and Viva and not less than 50% of the overall aggregate marks for the subject ie., University Examination marks and sessional marks of the subjects put together.

iii) There will be no provision to improve the sessional marks of any semester unless he /she repeats the semester.

vi) University Examinations will be conducted at the end of each semester for subjects offered during the semester.

v) Semester examinations will normally be conducted in October/November and in April/May of each year.

vi) All sessional work shall be valued and marks awarded on the basis of day to day performance, periodic tests and assignments. The allocation of sessional marks for individual subjects shall be on the following basis.

Theory Subjects		**Practicals**	
Attendance	10%	Attendance	10%
Assignment /Seminar	30%	Regular class work / Lab record / Class Performance	50%
Tests	60%	Tests	40%
Total	100%	Total	100%

The sessional marks allotted for attendance shall be awarded in direct proportion to the percentage of attendance secured by the candidate in the subject. However, full sessional marks for attendance shall be awarded to those who are securing 80% of the attendance and above.

R10. UNIVERSITY EXAM QUESTION PAPER PATTERN

The Question Paper pattern shall comprise of 2 parts:
PART A (10 x 3=30 marks) and
PART B (5 x 9=45 marks).
Total 75 marks
Part A shall have 30 marks, in which the student is expected to answer 10 short questions (3 marks each) out of 12 questions evenly prepared from all the five modules. These questions can consist of definitions, theoretical concepts, short illustrative examples, block schematics etc.
Part B shall have 2 questions from each module, out of which the student has to answer one from each module (9 marks). These can be descriptive type questions, derivations, problems or collection of 2 or more smaller questions in a topic. This offers 50% choice to the students, yet forces him to study all the five modules.

R11. PASSING REQUIREMENTS AND PROVISIONS

i. All Credits should be earned by a candidate to be qualified for the MCA.

ii. No disciplinary action is pending against him/her.

iii. A candidate shall be declared to have passed in any subject in full in any semester if he/she secures not less than 50% marks in sessional, not less than 40% marks in the University Examination including Project and Viva and not less than 50% of the overall aggregate marks for the subject ie., University Examination marks and sessional marks of the subjects put together.

iv. A candidate, who is absent or secures a grade F or less than 40% in ESE in any subject carrying sessional marks and ESE marks, will retain the already secured sessional marks for subsequent supplementary appearance in the examination of that subject.

v. A candidate who fails to submit the report on the project/industrial training within the prescribed date (or whose report is not accepted for reasons of incompleteness or other serious deficiencies) will have to register, redo the project / industrial training and submit the report at the end of a subsequent semester.

vi. A candidate who successfully completes the course satisfying all the passing requirements of the courses will be declared to be qualified for the award of MCA.

vii. Candidates who have passed all subjects of the Ten semesters at the first opportunity within Ten consecutive chances after the commencement of his/her study shall be ranked based on the CGPA obtained. In the case of a tie in the CGPA the total theory marks of the students who have secured same CGPA shall be considered for finalizing the rank.

viii. A candidate who qualifies for the award of IMCA degree having passed all the subjects of all the Ten Semesters within a period of maximum Ten consecutive semesters after the commencement of his/her study and secures a CGPA of 8 and above considering all the Ten semesters, will be declared to have passed the MCA degree in FIRST CLASS with DISTINCTION.

ix. A candidate who qualifies for the award of IMCA degree having passed all the subjects of all the Ten semesters within a period of maximum Ten consecutive semesters after the commencement of his/her study and secures a CGPA of 6.75 and above considering all the Ten semesters will be declared to have passed the MCA degree in FIRST CLASS.

x. All other successful candidates will be declared to have passed the MCA degree in SECOND CLASS.

xi. In the case of a student (regular / repeated /temporary break study) who has taken a **supplementary** chance for passing a subject will be given grade with regard to the mark obtained by the candidate in that exam and will be considered for all classification purpose.

xii. Candidates shall be declared to have qualified for the award of the MCA degree provided the Candidate has successfully completed the course requirements and has passed all the prescribed subjects of study in the ten semesters within a maximum period of seven years from the commencement of his/her study.

xiii. Every candidate shall, based on his/her project work/dissertation, send a paper for publication in journal or a conference in which all papers are published after usual review

xiv. Minimum for a pass

a. A candidate shall be declared to have passed a semester examination in full in the first appearance if he/she secures not less than SGPA 5 with a minimum of 'E' grade for the all individual subject in that semester.

b. A candidate shall be declared to have passed in an individual subject of a semester examination if he/she secures grade 'E' or above.

c. A candidate who does not secure a full pass in a semester examination as per clause (a) above will have to pass in all the subjects of the semester examination as per clause (b) above before he is declared to have passed in that semester examination in full.

R12. SCHEME OF EVALUATION

a. Credit System

Each subject shall have a certain number of credits assigned to it depending upon the academic load and the nature and importance of the subject. The credit associated with each subject will be shown in the prescribed scheme and syllabi. Each course shall have an integer number of credits, which reflects its weightage.

b. Grading

The University shall award the letter grade to students based on the marks secured by them in both internal assessment and semester end examinations taken together in the subjects registered. Each letter grade indicates a qualitative assessment of the student's performance and is associated with a specified number of grade points. The grading system along with the grade points for each grade, applicable to passed candidates is shown below. All passed candidate will be allotted a grade S, A, B, C, D, E, and F according to the total marks scored by him/her.

There will be a continuous evaluation system. Various components of evaluation are Teachers' Assessment (TA), Class Tests (CT) and University end semester examination (ESE). To make the evaluation more effective, teachers' assessment could be broken into various components

like assignments, quizzes, attendance, group discussions, tutorials, seminars, field visit reports etc. These two components i.e., TA & CT put together will form the sessional components. End semester examination will be conducted by the institution through concerned affiliating University, as per its rules and regulations.

On the basis total marks (TA+CT+ESE) for each subject obtained, a letter grade should be awarded, where S = 10, A = 9, B = 8, C = 7, D = 6, E = 5, F = 0. "F" denotes failure in the course.

All letter grades except 'F' will be awarded if the marks for the University examination is 40 % or above and the total mark (TA+CT+ESE) is 50 % or above. No absolute mark will be indicated in the grade card.

Letter grade corresponding to total marks (TA+CT+ESE) and the corresponding grade point in a ten-point scale is described in table below.

Letter grade corresponding to total marks and corresponding grade point in ten point scale

Range of % of total marks	Letter grade	Grade point
90 to 100	S	10
80 to 89	A	9
70 to 79	B	8
60 to 69	C	7
55 to 59	D	6
50 to 54	E	5
0 to 49	F	0

c. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

Semester Grade Point Average is the semester wise average points obtained by each student in a ten point scale. SGPA for a particular semester is calculated as per the formula shown below.

$$\mathbf{SGPA\ (S_j) = \sum (C_i \times G_i) / \sum Ci}$$

(SGPA = Total credit point awarded in a semester / Total credits of the semester)

Where '**Sj'** is the **jth** semester, **'Gi'** is the grade point scored by the student in the **ith** course **'ci'** is the credit of the **ith** course.

d. Cumulative Grade Point Average (CGPA)

Cumulative Grade Point Average shall be computed for all the students at the end of each semester by taking into consideration their performance in the present and the past semesters as follows:

$$\mathbf{CGPA = \sum (C_i \times S_i) / \sum Ci}$$

(CGPA = Total credit points awarded in all semesters / Total credits of the programme)

Where 'C_i' is the credits for the i^{th} semester, 'S_i' is the SGPA for the i^{th} semester.
SGPA a**nd CGPA shall be rounded to two decimal points.**

e. Grade Card The grade card issued to the students shall contain course codes and subject name, credits for the subject, letter grades obtained, SGPA for the semester and CGPA up to that particular semester. In addition to the grade cards for each semester all successful candidate shall also be issued a consolidated statement grades. On specific request from a candidate and after remitting the prescribed fees the University shall issue detailed marks to the individual candidate.

f. Conversion of CGPA to Percentage
For 7 point Grading system,the percentage shall be calculated on the basis of percentage of actual marks obtained by the candidates.

Equivalent Percentage $= \frac{\text{(CGPA obtained) X 100}}{\text{Maximum CGPA(=10)}}$

(Suppose a candidate has scored CGPA 8.25on a 7 point scale,

$$\% = \frac{8.25 \text{ X } 100}{10} = \frac{825}{10} = 82.5 \text{)}$$

R13. REVISION OF REGULATIONS

Notwithstanding all that has been stated above, the University has the right to modify any of the Regulations, Scheme of Studies, Examinations and Syllabi from time to time.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)OF THE INTEGRATED MCA PROGRAMME LEADING TO A DEGREE IN MCA

1. PEO1: To impart knowledge to students in foundation of mathematics, computer application, problem solving and decision-making technique for effective implementation in the area of software development.

2. PEO2: Student will be capable of communicating effectively and use recent technology, environments and platform in analyzing, designing, developing and maintaining complex application in computer domain that are technically sound, economically feasible and socially acceptable.

3. PEO3: Students will exhibit communication skills, team work, ethical attitude, professionalism and adapt to current trends by engaging in lifelong learning.

PROGRAMME OUTCOME (PO)

At the end of the Programme, a student will be able to achieve the following programme outcomes:

1.Computational Knowledge:

Apply knowledge of computing fundamentals, computing specialization, mathematics, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

2.Problem Analysis:

Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines.

3.Design /Development of Solutions:

Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

4.Conduct Investigations of Complex Computing Problems:

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

5.Modern Tool Usage:

Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.

6.Professional Ethics:

Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practice.

7.Life-long Learning:

Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.

8.Project management and finance:

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

9.Communication Efficacy:

Communicate effectively with the computing community, and with society at large, about *complex* computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.

10.Societal and Environmental Concern:

Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.

11.Individual and Team Work:

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.

12.Innovation and Entrepreneurship

Identify a timely opportunity and using innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM SPECIFIC OBJECTIVES (PSO)

PSO1: Recent Technology

Students will have sound theoretical knowledge and skill for analysing real life problems, design complex computing systems appropriate to its solutions with the recent technology.

PSO2: Employability Skill

After Completing this program students will have ability to pursue their career professionally with ethics as an individual or as a member of a team in software industry, corporate sector, Government organization, academia, research, consultancy firm, entrepreneurship and will possess knowledge and skill for problem solving and decision making.

PSO3: Management /Leadership skill and Analytical Reasoning

After this program students will possess management and leadership skill, analytical reasoning for solving time critical problems with best professional ethical practice, environmental and social concern.

MAPPING OF PO TO PEO

Program Educational Objectives	PEO1	PEO2	PEO3
Program Outcomes			
PO1: Computational Knowledge	√	√	
PO2: Problem Analysis		√	
PO3: Design /Development of Solutions		√	
PO4: Conduct Investigations of Complex Computing Problems		√	
PO5: Modern Tool Usage		√	√

PO6: Professional Ethics		√	√
PO7: Life-long Learning			√
PO8: Project management and finance		√	
PO9: Communication Efficacy		√	√
PO10: Societal and Environmental Concern		√	√
PO11: Individual and Team Work	√	√	√
PO12: Innovation and Entrepreneurship		√	√
PSO1: Recent Technology		√	√
PSO2: Employability Skill		√	√
PSO3: Management /Leadership skill and Analytical Reasoning		√	√

SCHEME

SEMESTER I

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA1C01	English	4	-	-	25	75	100	4
2	IMCA1C02	Digital Electronics and Microprocessors	4	1	-	25	75	100	4
3	IMCA1C03	Statistics	4	-	-	25	75	100	4
4	IMCA1C04	Introduction to Computers & PC Hardware	4	-	-	25	75	100	4
5	IMCA1C05	Programming Methodology & C Programming	4	1	-	25	75	100	4
6	IMCA1P06	PC hardware Practicals	-	-	4	25	75	100	2
7	IMCA1P07	C Practicals	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER II									
Sl no	**Course code**	**Subject**	**Hours / week**			**Sessional**	**ESE**	**Total**	**Credits**
			L	**T/P**	**P**				
1	IMCA2C01	Fundamentals of Accounting	4	-	-	25	75	100	4
2	IMCA2C02	Probability and Statistics	4	-	-	25	75	100	4
3	IMCA2C03	Computer Organization And Architecture	4	-	-	25	75	100	4
4	IMCA2C04	Data Structures- C	4	1	-	25	75	100	4
5	IMCA2C05	Object Oriented Programming with C++	4	1	-	25	75	100	4
6	IMCA2P06	Data Structures -C Practicals	-	-	4	25	75	100	2
7	IMCA2P07	C ++ Practicals	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24
L-Lecture T-Tutorial P-Practical ESE-End Semester Examination									

SEMESTER III

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA3C01	Mathematical Foundation of Computer Science	4	-	-	25	75	100	4
2	IMCA3C02	Management Information Systems	4	-	-	25	75	100	4
3	IMCA3C03	DBMS AND NO SQL	4	1	-	25	75	100	4
4	IMCA3C04	Principles of Management	4	-	-	25	75	100	4
5	IMCA3C05	Visual Programming(C#.NET)	4	1	-	25	75	100	4
6	IMCA3P06	DBMS Practical (ORACLE & Mongodb)	-	-	4	25	75	100	2
7	IMCA3P07	Visual Programming Practicals	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER IV

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA4C01	Technical Communication	4	1	-	25	75	100	4
2	IMCA4C02	Java	4	1	-	25	75	100	4
3	IMCA4E01	Elective I	4	-	-	25	75	100	4
4	IMCA4C03	System Software	4	-	-	25	75	100	4
5	IMCA4C04	E-Commerce	4	-	-	25	75	100	4
6	IMCA4P05	Java Practicals	-	-	4	25	75	100	2
7	IMCA4P06	RDBMS Practicals	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER V

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA5C01	Operations Research	4	-	-	25	75	100	4
2	IMCA5C02	Operating Systems	4	1	-	25	75	100	4
3	IMCA5C03	Web Technology	4	1	-	25	75	100	4
4	IMCA5C04	Object Oriented Modeling and Design	4	-	-	25	75	100	4
5	IMCA5C05	Software Engineering And Project Management	4	-	-	25	75	100	4
6	IMCA5P06	Python Programming Practicals	-	-	4	25	75	100	2
7	IMCA5P07	Web Technology Practicals	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER VI

Sl.No	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA6C01	Research Methodology	4	-	-	25	75	100	4
2	IMCA6C02	Data Communications	4	-	-	25	75	100	4
3	IMCA6E02	Elective II	4	-	-	25	75	100	4
4	IMCA6S01	Seminar- I	-	-	2	100	-	100	2
5	IMCA6CP1	Software Development-Project I	-	-	4	25	75	100	6
Total			12	-	6	-	-	500	20

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER VII

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA7C01	Linux OS and Shell programming	4	1	-	25	75	100	4
2	IMCA7C02	Analysis & Design of Algorithms	4	-	-	25	75	100	4
3	IMCA7C03	Data Mining & Warehousing	4	-	-	25	75	100	4
4	IMCA7C04	Cryptography	4	-	-	25	75	100	4
5	IMCA7C05	Computer Networks	4	-	-	25	75	100	4
6	IMCA7P06	PHP Programming Practicals	-	1	4	25	75	100	2
7	IMCA7P07	Linux OS and Shell programming Practicals	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER VIII

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA8C01	Employbility Skills	4	-	-	100	-	100	4
2	IMCA8C02	Artifitial Intelligence	4	-	-	25	75	100	4
3	IMCA8C03	Internet Technology And Applications	4	1	-	25	75	100	4
4	IMCA8C04	Compiler Design	4	1	-	25	75	100	4
5	IMCA8E03	**Elective III**	4	-	-	25	75	100	4
6	IMCA8P05	Compiler Design Practicals	-	-	4	25	75	100	2
7	IMCA8CP2	Mini Project - Application Development	-	-	4	25	75	100	2
Total			20	2	8	-	-	700	24

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER IX

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCA9C01	Computational Sustainability	4	-	-	25	75	100	4
2	IMCA9C02	Network Security with IPR	4	1	-	25	75	100	4
3	IMCA9C03	Data Science	4	1	-	25	75	100	4
4	IMCA9C04	IT Infrastructure Management	4	-	-	25	75	100	4
5	IMCA9E04	Elective IV	4	-	-	25	75	100	4
6	IMCA9P05	Data Science Practicals	-	-	4	25	75	100	2
7	IMCA9P06	Cloud Computing Practicals	-	-	2	25	75	100	2
8	IMCA9S02	Main Seminar – Current Trends			2	100	-	100	2
Total			20	2	8	-	-	800	26

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

SEMESTER X

Sl no	Course code	Subject	Hours / week			Sessional	ESE	Total	Credits
			L	T/P	P				
1	IMCAXCP3	Main Project-Application Development	-	-	-	150	100	250	8
2	IMCAXCVV	Viva-Voce	-	-	-	50	100	150	4
Total			-	-	-	-	-	400	12

L-Lecture T-Tutorial P-Practical ESE-End Semester Examination

LIST OF ELECTIVES (ANY 1 FROM THE FOLLOWING LIST)

Elective I – Semester IV

1. Client server Computing
2. Parallel Processing
3. Enterprise Resource Planning

Elective II – Semester VI

1. Android Programming
2. Real Time Operating System
3. Distributed Processing
4. Embeded System Design

Elective III – Semester VIII

1. Social Network analysis
2. Knowledge Management and Business Intelligence
3. Foundation of Cloud Computing
4. Computer Graphics

Elective IV – Semester IX

1. Application Development and Maintainance
2. Software Testing
3. Customer Relationship Management
4. Informatics and Cyber Ethics
5. Machine Learning

Semester I

IMCA1C01 ENGLISH

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1C01
Course Title	ENGLISH
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

English has been gaining grounds in global communication. To emerge as a winner and stand apart from the crowd in today's fierce competitive world, an individual must have excellent communication skills. A high degree of proficiency in English and excellent communication skills enhance the student's employability. Communication Skills in English aims to develop students' ability to use English accurately, appropriately, and fluently.The course intends to introduce the students to the speech sounds of English to enable them to listen to English and speak with global intelligibility. It introduces listening skills, barriers to listening and the strategies of academic reading such as scanning, skimming, surveying, predicting, and making inferences. It also aims to enhance the learners' group discussion and telephone skills.

Course Objectives

By the end of the course the students will be able to:

1. Develop the ability to use English language accurately and effectively by enhancing their communication skills.
2. Introduce the students to the speech sounds of English to enable them to listen to English and speak with global intelligibility.
3. Enable the students to speak English confidently and effectively in a wide variety of situations.
4. To improve their reading efficiency by refining their reading strategies.
5. Enhance group discussion skill

Course Outcomes

On successful completion of the course, the students will be able to:

CO.No	Course Outcome Description
IMCA1C01.1	Define and identify various methods to develop communication skills.
IMCA1C01.2	Discuss and describe the strategies to improve listening, speaking, reading, and writing skills.
IMCA1C01.3	Explain the skills required for creating a formal speech and participating in group discussion.
IMCA1C01.4	Classify the sounds of English and their symbols.
IMCA1C01.5	Develop the ability to converse on any topic.

Detailed Syllabus

Topic	Session	References
Module I Phonetics-Air Stream Mechanism organs of speech-The Respiratory System, The Phonatory System, The Articulatory System, Phonemic Symbols – Vowels, Diphthongs, Consonants	1-12	Cambridge English Pronouncing Dictionary A textbook of ENGLISH PHONETICS for Indian students – T. Balasubramanian.
Module II Syllables - Word stress - Stress in Polysyllabic Words. Stress in words used as different parts of speech - Sentence Stress. Word Stress and Rhythm – Pauses and Sense Groups,Weak forms and Strong Forms.Intonation - Falling and Rising Tones –Fluency and Pace of Delivery.Awareness of different accents: American, British, and Indian Influence of the Mother Tongue	13-23	Cambridge English Pronouncing Dictionary A textbook of ENGLISH PHONETICS for Indian students – T. Balasubramanian. V.Sasikumar, P.Kiranmai Dutt and Geetha Rajeevan,. "Communication Skills in English" Cambridge University Press and Mahatma Gandhi University.
Module III Active listening – Barriers to listening – Listening and Notetaking .Art of Small Talk – Participating in Conversations. Making a Short Formal Speech. Describing People, Place, Events and Things	24-31	Study Listening: A Course in Listening to Lectures and Note-taking by Tony Lynch. V.Sasikumar, P.Kiranmai Dutt and Geetha Rajeevan,. "Communication Skills in English" Cambridge University Press and Mahatma Gandhi University.
Module IV Group Discussion Skill, Telephone Skill.	32-35	V.Sasikumar, P.Kiranmai Dutt and Geetha Rajeevan,. "Communication Skills in English" Cambridge University Press and Mahatma Gandhi University.
Module V Reading: Theory and Practice – Scanning - Surveying a textbook using an index - Reading with a purpose. Making predictions – Understanding text structure – Locating main points.Making inferences - Reading graphics - Reading critically – Reading for research	36-40	V.Sasikumar, P.Kiranmai Dutt and Geetha Rajeevan,. "Communication Skills in English" Cambridge University Press and Mahatma Gandhi University

References:

1. V.Sasikumar, P.Kiranmai Dutt and Geetha Rajeevan,. "Communication Skills in English" Cambridge University Press and Mahatma Gandhi University.
2. A Course in Reading Skills for Academic Purposes by Glendinning, Eric H. and BeverlyHolmstrom
3. Communication Studies by Sky Massan
4. Course in Spoken English for Academic Purposes by Anderson, Kenneth, Joan Maclean and Tony Lynch
5. A textbook of ENGLISH PHONETICS for Indian students – T. Balasubramanian.

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IMCA1C02 DIGITAL ELECTRONICS & MICROPROCESSORS

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1C02
Course Title	Digital Electronics & Microprocessors
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

Basic objective of this course is to introduce the fundamentals of basic electronics, microprocessors and an introduction to microcontrollers. Students will learn about number systems, gates, combinational and sequential circuits. Also, the basic architecture and instructions of the first 16-bit microprocessor 8086. An introduction to microcontroller 8051 is presented to understand the fundamentals of microcontroller working and its signals.

Course Objectives

By the end of the course the students will be able to:

1. Acquaint with the fundamental principles of two-valued logic and various circuits used to implement logical operations.
2. Know the basics for further studies in areas such as microprocessor and microcontroller.

Course Outcomes

On successful completion of the course :

CO.No	Course Objective Description
IMCA1C02.1	Students will be able to understand the number systems and codes
IMCA1C02.2	Students will be able to draw basic circuits using gates AND, OR, NOT, NAND, NOR, XOR etc.
IMCA1C02.3	Students will be able to understand the working of basic combinational circuits and sequential circuits
IMCA1C02.4	Students will learn the architecture, signals of 8086 processor.
IMCA1C02.5	Students will be able to learn the difference between processor and controller, learn about instructions and signals of controller.

Detailed Syllabus:

Topic	Session	References
Module I Number systems – Efficiency of number system, Decimal, Binary, Octal, Hexadecimal, conversion from one to another, Binary addition, Subtraction,Multiplication and Division, Representation of signed numbers, Addition and subtraction using 2'scomplement and 1's complement. Binary codes – BCD code, Error detection codes, Error correcting code-Hamming code.	1-7	Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
Module II Logic Gates – Basic logic gates- AND, OR, NOT, NAND, NOR, Exclusive OR, Exclusive NOR gates- Logic symbols, Truth table and timing diagrams. Boolean Algebra – Basic laws and theorems, Boolean functions, Truth table, Minimization of Boolean function using K map method, Realization using logic gates and universal gates.	8-15	Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
ModuleIII Combinational circuits – Half adder,Full Adder, Decoders, Encoders,Multiplexers,Demultiplexers,Sequential circuits – Flip Flops – RS,JK, D Flip Flops, Master slave Flip Flops.Registers – Serial in serial out,Serial in Parallel out, Parallel in serial out, Parallel in Parallel out registers, Bidirectional shift registers.Counters-Synchronous and asynchronous counters, Counters using shift registers.	16-26	Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
ModuleIV 8086 Register Organization of 8086, Architecture. Signal Description of 8086, Minimum Mode 8086 System and Timings,Maximum Mode 8086 System andTimings.Addressing Modes of 8086.	27-33	Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
ModuleV Instruction Set of 8086. Use of stack. Interrupts – Types of Interrupts and Interrupt Service Routine.Microcontrollers: Architecture of 8051 Microcontroller – Signals.	34-40	Bhurchandi and Ray, "Advanced Microprocessors and Peripherals", Third Edition

Recommended Books & Reading List

1. Digital principles and Applications- Albert Paul Malvino, Donald P Leach, McGraw Hill
2. Bhurchandi and Ray, "Advanced Microprocessors and Peripherals", Third Edition McGraw Hill, 2006.
3. Fundamentals of Digital Circuits – A Anand Kumar, PHI Learning Pvt. Ltd. 2nd edition, 2013
4. Digital logic and Computer Design – Morris Mano, Prentice Hall of India,2004.
5. Digital Fundamentals – Floyd, Pearson Education, 2009.
6. Digital computer Fundamentals – Thomas C Bartee, McGraw Hill.

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IMCA1C03 STATISTICS

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1C03
Course Title	Statistics
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Basic objective of this course is to understand the basic concepts in Statistics. It also introduces students to different methods to calculate central tendency and measure of dispersion. It gives an idea of skewness, moments, and kurtosis. It also gives an idea to calculate the relation between two variables in statistics.

Course Objectives

By the end of the course the students will be able to:

1. understand the concepts central tendency.
2. understand the concepts of measure of dispersion.
3. understand the correlation between two variables.

Course Outcomes

On successful completion of the course :

CO.No	Course Outcome Description
IMCA1C03.1	Students will be able to understand and reproduce the core concepts of Statistics.
IMCA1C03.2	Students will be able to understand the concepts related to basic ideas in Statistics.
IMCA1C03.3	Students will be able to apply mathematical formulae to find the values in Statistics.
IMCA1C03.4	Students will have the ability to create a mathematical model from the real life problems.
IMCA1C03.5	Students will be able to evaluate different parameters in Statistics.

Detailed Syllabus:

Topic	Session	References
Module I **Scope and Limitations of Statistics** Introduction, Limitations of Statistics, Misuse of Statistics.Collection of data- primary and secondary data, collection of primary data.Classification and tabulation-methods of classification and tabulation	1-2	Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications.
ModuleII Diagrams and Graphs Pictorial representation of data, Representation of categorical data.Graphs of frequency distribution, ogives and uses of ogives.	6-9	Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications
ModuleIII Measures of central tendency and Dispersion Definition of central tendency, Measures- Mean, Median, Mode, Geometric Mean , Harmonic Mean,Dispersion – Introduction, Absolute and relative measures of dispersion-Range, Inter- quartile range, quartile deviation, Mean deviation and standard deviation	10-22	Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications
ModuleIV **Skewness, Moments and Kurtosis** Definition and types of Skewness, Measures of Skewness-Karl pearson's coefficient of skewness, Bowley's coefficient of skewness.Moments- raw and central moments.Kurtosis	23-30	Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications
ModuleV Correlation and Regression Meaning and definition, types of correlation,Karl Pearson's coefficient of correlation.Rank correlation,Regression-Meaning and definition, types of regression.Lines of regression.	31-39	Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications

Recommended Books & Reading List

1. Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications.
2. Introduction to Probability and Statistics, Medenhall, Thomson Learning , 12 Edn.\
3. B.L. Agarwal: Basic Statistics, New Age International (p) Ltd. 4) Murthy M.N.: Sampling theory and Methods, Statistical Publishing Society, Calcutta

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IMCA1C04 INTRODUCTION TO COMPUTERS AND PC HARDWARE

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1C04
Course Title	Introduction to Computers and PC Hardware
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Basic objective of this course is to describe the internal components of a computer, assemble a computer system, and troubleshoot using system tools. This course covers the fundamentals of computer hardware and software as well as advanced concepts.

Course Objectives

By the end of the course the students will be able to:

1. Understand the names and functions of hardware ports and the parts of the motherboard.
2. Identify the names and distinguishing features of different kinds of input and output devices
3. Understand how the CPU processes data and instructions and controls the operation of all other devices.
4. Understand different kinds of memory and storage devices

Course Outcomes

On successful completion of the course :

CO.No	Description
IMCA1C04.1	Students will be able to understand and identify computer hardware and peripheral devices
IMCA1C04.2	Students will be able to explain the function of the system components, including CPU, motherboard and system unit
IMCA1C04.3	Students will be able to diagnose and troubleshoot computer systems hardware and software, and other peripheral equipment
IMCA1C04.4	Students will have the ability to identify types and characteristics of various peripherals, including storage and I/O
IMCA1C04.5	Students will be able to explain the purpose of preventive maintenance and identify the elements of the troubleshooting process and install an operating system.

Detailed Syllabus:

Topic	Session	References
ModuleI Introduction to computer: Basic Components of a Computer, History, Types of computers. **Interacting with computers**: Input Devices - Keyboard, Mouse, Hand held devices, Optical Input devices. Output devices: Printers, Display Devices, Scanners	1-6	The Complete Reference – PC Hardware – Craig Zacker & John rourke
Module II Data processing – CPU, ALU, Control Unit & Registers.**Memory**- RAM, Variants of RAM, ROM, Variants of ROM **Physical Memory organization**: DIP, SIMM, DIMM, SIPP	7-14	PC Hardware – A Beginners Guide
ModuleIII Introduction of PC- Getting started with PC hardware support.Operating systems, CPUs and motherboards.Basic Input/output System, Memory systems, Bus structures, Expansion cards, Ports, connectors, and cables.Data storage devices, Video and multimedia input/output devices	15-25	PC Hardware – A Beginners Guide
Module IV Hard Disk: Hard disk drive components- Disk Geometry: Sides or heads, track, cylinder, sector, **Disk Recording**: Data recording method, writing on reading from a magnetic disk. **Hard Disk formatting**: Concepts of Interfacing Formatting: Low level and high level.	26-33	PC Hardware – A Beginners Guide
ModuleV Mother Board: CPU socket, Memory and secondary Cache sockets or chips, ROMBIOS and BIOS CMOS, Universal serial bus.**Secondary Storage Devices**: Floppy disk, CD Family, DVD, ZIP Drive.**General Trouble shooting and PC Maintenance**: Installation of processor, SMPS, HDD, RAM, Drives, cards, devices and cables	34-40	PC Hardware – A Beginners Guide

Recommended Books & Reading List

1. The Complete Reference – PC Hardware – Craig Zacker & John rourke, Edition 2001 Tata McGraw Hill
2. All About Hard Disk, Manohar Lotia
3. All About Motherboard, Manohar Lotia
4. PC Hardware – A Beginners Guide , Rongilster , 2001

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IMCA1C05 PROGRAMMING METHODOLOGY & C PROGRAMMING

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1C05
Course Title	Programming Methodology & C Programming
Type of Course	Core
Contact Hours	4T +1T/P hours per week
Credit	4

Course Description

This course introduces the students to C programming. It covers in detail the basic concepts of C Programming including data types, operators and expressions, simple input and output statements, conditional statements, repetitive statements. It gives an overview of functions, the storage classes in c, single and multidimensional arrays, character strings, pointers, structures, and unions. The course also covers the general concept of files, low level programming features like register variable, bitwise operations, bit fields and additional features of C such as enumeration, command line parameters, macros, the C preprocessor

Course Objectives

By the end of the course the students will be able to:

1. Be familiar with the basic constructs of C Language.
2. Learn how to write algorithms and draw flowcharts.
3. Develop the ability to write structured, modular programs.
4. Improve their problem-solving capacity.

Course Outcomes

On successful completion of the course :

CO. No	Course Outcome Description
IMCA1C05.1	Students will be able to list the different datatypes, operators, statements, pre-defined functions in C
IMCA1C05.2	Students will be able explain the usage of different program elements in C.
IMCA1C05.3	Students will be able to develop modular programs using the various C programming constructs.
IMCA1C05.4	Students will have the ability to write algorithms/ flowcharts / programs to Solve problems of varied nature.
IMCA1C05.5	Students will be able compare the different memory allocation mechanisms and elaborate how they help to create efficient solutions to problems.

Detailed Syllabus:

Topic	Session	References
ModuleI Introduction to algorithm, pseudo code, flowchart, structured programming concept.**Introduction to C Language**: The C character set, identifiers and keywords, data types, constants, variables, arrays, declarations, expressions, statements, Introduction to preprocessor directives, symbolic constants.**Data input and output:** Single character input, single character output, scanf, printf, puts, gets functions.	1-7	Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010
ModuleII Operators and expressions: Arithmetic operators, unary operator, relational and logical operator, assignment operators, the conditional operator, type conversion, Library function. **Control statement:** Branching: if else statement, looping, nested control structure, switch statement, break statement, continue statement, comma operator, goto statement.	8-15	Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010
Module III Functions: Overview, function prototypes, passing arguments to a function, recursion. **Program structure**: Storage classes, automatic variables, external variables, static variables, multifile program,**Arrays**: Defining an array, passing array to functions, multidimensional arrays, **Strings**: one dimensional character array, array of strings	16-25	Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010
Module IV Pointers: Fundamentals, void pointer, null pointer, passing pointers to a function, pointers and one dimensional arrays, dynamic memory allocation, operation on pointers, pointers and multidimensional arrays, array of pointers, pointer to an array, pointers and strings, pointers to function, pointers and variable length arguments list, passing functions to other functions. **Structures and unions:** Defining a structure, processing a structure, user defined data types, structure, and pointers, passing structure to function, self-referential structures, and union	26-35	Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010
ModuleV Data files: Why files, opening and closing a data file, reading, and writing a data file, processing a data file, unformatted data file, concept of binary file.**Low level programming:** Register variable, bitwise operations, bit fields.**Additional features of C**: Enumeration, Command line parameters, Macros (definition, function macros, conditional macros), C Preprocessor	36-42	Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010

Recommended Books & Reading List

1. Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010
2. The C programming language – Brian W Kernighan & Dennis Ritchie IInd edition Eastern Economy Edition, Prentice Hall 2001
3. Computer Science: A Structured Programming Approach Using C, Forouzan, 3rd Cengage Learning 2007
4. C- How to program, Deitel & Deitel, Pearson Education Asia, 6th Edition,2009
5. Programming in C –Pradip Dey, Manas Ghosh – Oxford Higher Education ,2007
6. ANSI C programming, Bronson, Cengage Learning , C2009
7. Understanding pointers in C- Yashavant Kanetkar – BPB publication , 2009

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IMCA1P06 PC HARDWARE PRACTICALS

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1P06
Course Title	PC HARDWARE PRACTICALS
Type of Course	Core
Contact Hours	4 Hours per week
Credit	2

Course Description

Hardware is the most visible part of any information system: the equipment such as computers, scanners and printers that is used to capture data, transform it and present it to the user as output. Focus of this course is on the personal computer (PC) and the peripheral devices that are commonly used with it, the same principles apply to the different types of computers.

Course Objectives

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

1. Identify the computer hardware.
2. Have knowledge on the processors, memories, motherboards, different add-on cards, and other peripherals like printers, plotters and the scanners
3. Assemble and disassemble the PCs.
4. Maintain and troubleshoot peripheral components.
5. Troubleshoot system components.
6. Install and configure operating systems.
7. Maintain and troubleshoot installations of Microsoft Windows/LINUX/UNIX.

Course Outcomes

On successful completion of the course :

CO.No	Description
IMCA1P06.1	Students will be able to Identify the components of standard desktop personal computers and identify fundamental components and functions of personal computer operating systems.
IMCA1P06.2	Students will be able to understand the difference between an operating system and an application program, and what each is used for in a computer.
IMCA1P06.3	Students will be able to Install and configure system components and Operating system with device Drivers.
IMCA1P06.4	Students will have the ability to assemble the fundamental hardware components that make up a computer's hardware to form a working computer.
IMCA1P06.5	Students will be able Maintain and troubleshoot peripheral components. Troubleshoot system components.

Detailed Syllabus:

Topic	Session
Identification of PC Components Demonstration of Personal Computer Identification of Input Output Ports of CPU	1-3
Study of various Components of Motherboard	4-6
Assembling the PC Replacing and fitting of Hard Disk and Floppy Disk on PC Identification of different cards in the PC Replacing and fitting Processors, Motherboards and Memory Connecting input output device	7-12
Understanding BIOS set up	13
Installation of Operating Systems and formatting the Hard Disk	14-15
Installation of Software Packages	16
PC Tools and its use Disc Managers and it's use Backup and Restoration utility	17-19
Virus removal and disc scan	20-21
Connecting input/output devices and installation of their driver software. Configuration of Audio and Video	22-25
Trouble shooting of the PC	26-28
Installation of LINUX/UNIX OS with Windows OS (Dual Boot)	29-30

Recommended Books & Reading List

1. The Complete Reference – PC Hardware – Craig Zacker & John rourke, Edition 2001 Tata McGraw Hill
2. All About Hard Disk, Manohar Lotia
3. All About Motherboard, Manohar Lotia
4. PC Hardware – A Beginners Guide , Rongilster , 2001

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IMCA1P07 C PRACTICALS

Course Overview

Program	IMCA
Semester	1
Course Code	IMCA1P07
Course Title	C Practicals
Type of Course	Core
Contact Hours	4 Hours per week
Credit	2

Course Description

The course introduces the students to the fundamentals of C programming language It covers in detail the basic programming concepts of C. They learn the syntax and semantics of various programming constructs in c. Students use these constructs to solve different problems. It aims to improve a student's problem-solving ability by laying emphasis on formulating problems.

Course Objectives

By the end of this course Students will be able to:

1. Design solutions for simple and complex problems.
2. Develop modular programs.
3. Write programs using good programming style in C.
4. Enhance their problem-solving capacity.
5. Learn how to Test and debug C programs.

Course Outcomes

On successful completion of this course:

CO.No	Course Objective Description
IMCA1P07.1	Students will be able to show the representation of data structures such as arrays, structures, unions.
IMCA1P07.2	Students will be able to explain the syntax and semantics of different programming constructs in C.
IMCA1P07.3	Students will be able to apply modular programming concepts to develop reusable program elements.
IMCA1P07.4	Students will have the ability to solve problems of varying natures using different program constructs.
IMCA1P07.5	Students will be able analyze problems encountered in everyday life, decide on the functionality required to solve it and create efficient solutions to problems.

Detailed Syllabus:

Topic	Session	References
Section A Implementation of the various Data Types in C. Demonstration of Data type conversion (Hint: Usage of type casting). Implementation of various Storage Types.	1-5	
Demonstration of nested if (Hint: Use logical operators). Demonstration of switch... case structure.	6-10	
Demonstration of for loop. Demonstration of do...while loop. Demonstration of while loop.	11-14	
Implementation of arrays Implementation of multidimensional arrays (Hint: implement matrix operation).	15-17	
Implementation of functions (Hint: Demonstrate call by value, call by address, passing of arrays). Demonstration of various string operations (Hint: Usage of user defined functions only allowed). Demonstration of recursion (Hint: factorial, Fibonacci series).	18-20	
Demonstration of pointer operations.	21-25	
Section B Implementation of structures (Hint: simple structure operations, array of structures). Implementation of Union. Implementation of pointers to structures and unions.	26-30	
Demonstration of dynamic allocation of memory (Hint: malloc, calloc, realloc, free). Demonstration of sorting techniques (Hint: selection sort, bubble sort). Demonstration of searching techniques (Hint: linear search, binary search).	31-34	
Demonstration of various file operations. Implementation of character counting, line counting and word counting for a file.	35-39	
Demonstration of bitwise operations. Demonstration of macro processing.	40-41	

Recommended Books & Reading List

1. The C programming language – Brian W Kernighan & Dennis Ritchie IInd edition Eastern Economy Edition, Prentice Hall 2001
2. Programming with C – Byron s Gottfried second edition – Schaum's outlines 2nd Edition, 2010
3. Computer Science: A Structured Programming Approach Using C, Forouzan, 3rd Cengage Learning 2007
4. C- How to program, Deitel & Deitel, Pearson Education Asia, 6th Edition,2009
5. Programming in C –Pradip Dey, Manas Ghosh – Oxford Higher Education ,2007

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Semester II

IMCA2C01 FUNDAMENTALS OF ACCOUNTING

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2C01
Course Title	Fundamentals of Accounting
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

The course Fundamentals of Accounting aims to provide basic knowledge about business transactions and types of accounting treatment. The course explains the basics of financial accounting and its analysis.

Course Objectives

By the end of the course the students will be able to:

1. Get insights into basic knowledge of business transactions.
2. Be familiar with Book Keeping and various types of accounting.
3. Able to understand the double entry system of book keeping.
4. Able to prepare final accounts.
5. Analyze the financial position of the organization.

Course Outcomes

On successful completion of this course :

CO No	Course Objective Description
IMCA2C01.1	Students will be able to know about the need and importance of accounting.
IMCA2C01.2	Students will be able to understand the different types of accounting systems.
IMCA2C01.3	Students will be able to apply the rules of accounting system to prepare the books of accounts.
IMCA2C01.4	Students will be able to construct Final Accounts from the business transaction.
IMCA2C01.5	Students will be able to evaluate the business position of the organizations from their financial statements.

Detailed Syllabus

Topic	Session	References
Module I Accounting and its Functions, Scope of Accounting, Emerging Role of Accounting Accounting as an Information System, Internal and external users of accounting information Forms of organization:- sole proprietorship, partnership and company. Role and Activities of an Accountant, Accounting Concepts.	1-6	Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd An Introduction to Accountancy, Maheshwari S.N & Maheshwari S K (Vikas)
Module II Accounting Equation, Classification of Accounts, Definitions of Journal and Ledger.Journalizing Process, Ledger Posting , Balancing and Account.	7-18	Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd,An Introduction to Accountancy, Maheshwari S.N & Maheshwari S K (Vikas)
Module III Trial Balance. Objectives of trial balance. Preparing Trial Balance.Preparation of Final Accounts: Trading accounts Profit & loss a/c Balance sheet	19-27	Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd,An Introduction to Accountancy, Maheshwari S.N & Maheshwari S K (Vikas)
Module IV Adjustment Entries of Final accounts: Adjustment with respect to Closing stock Outstanding expenses, Prepaid expenses Accrued income, Income received in advance Depreciation, Bad debts, Provision for doubtful debts, Provision for discount on debtors	28-33	Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd,An Introduction to Accountancy, Maheshwari S.N & Maheshwari S K (Vikas)
Module V Analysis of financial statement: Ratio Analysis , solvency ratios, profitability ratios, liquidity ratios Common Size Statement Comparative Balance Sheet and Trend Analysis	34-40	Fundamentals of Accounting and Financial Analysis Chowdhary Anil(Pearson Education)

Recommended Books & Reading List

1.Accounting for Management, Srinivasan & Murugan, S.Chand & Company Ltd
2.An Introduction to Accountancy, Maheshwari S.N & Maheshwari S K (Vikas)
3.Fundamentals of Accounting and Financial Analysis Chowdhary Anil(Pearson Education)

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IMCA2C02 PROBABILITY AND STATISTICS

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2C02
Course Title	Probability And Statistics
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Basic objective of this course is to understand the basic concepts in Probability and estimation. It also introduces students to different probability distributions in probability. It gives an idea of sampling and Estimation theory. It also introduces some methods to test a hypothesis.

Course Objectives

By the end of the course the students will be able to:

1. Students must understand the concepts probability and probability distributions.
2. Students must understand the concepts of sampling and estimation of parameters
3. Students must understand the concepts of testing.

Course Outcomes

On successful completion of this course:

CO No	Course Objective Description
IMCA2C02.1	Students will be able to understand and reproduce the core concepts of probability.
IMCA2C02.2	Students will be able to understand the concepts related to basic ideas in probability, sampling and testing.
IMCA2C02.3	Students will be able to apply mathematical formulae to find the values in probability.
IMCA2C02.4	Students will have the ability to create a statistical model from the real-life problems.
IMCA2C02.5	Students will be able to evaluate the probability of an event.

Detailed Syllabus:

Topic	Session	References
Module I- Probability Theory Introduction, Sample space, Events, Different approaches to probability,Addition and multiplication theorems on probability, Independent events, conditional probability, Bayes theorem	1-7	Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.
Module II- Random Variables and Mathematical Expectations Random Variables , probability functions and distribution functions, marginal density functions, joint density functions. Mathematical Expectation- Definition, elementary properties of expectation, Mean ,Variance	8-16	Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.
Module III- Standard distributions Discrete probability distributions-Uniform distribution.Binomial distribution, Poisson distribution.Continuous probability distributions-Uniform distribution,Normal distribution	17-23	Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.
Module IV- Sampling and Estimation Theory of Sampling-population and sample, Types of sampling,Theory of Estimation-Introduction to point estimation and Interval estimation.Central Limit theorem (statement only)	24-31	Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.
Module V- Testing of Hypothesis errors, level of significance, critical region,Large sample Tests-Testing of hypothesis concerning mean of a population equality of means of two populations(large samples only)	32-40	Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.

Recommended Books & Reading List

1) Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition- April 2004, Himalaya Publications.
2) Fundamentals of Mathematical Statistics- S.C.Gupta ,V.K.Kapoor. Sultan Chand Publications.
3) Introduction to Mathematical Statistics -Robert V. Hogg &Allen T. Craig. Pearson education. 12 Edn.
4) Probability and Statistics – Schaums outline series

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IMCA2C03 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2C03
Course Title	Computer Organization And Architecture
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course will introduce students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It will cover computer arithmetic, CPU structure and functions, memory system organization and architecture and system input/output. The emphasis is on studying and analyzing fundamental issues in architecture design and their impact on performance.

Course Objectives

By the end of the course the students will be able to:

1. To conceptualize the basics of organizational and architectural issues of a digital computer.
2. To analyze performance issues in processor and memory design of a digital computer.
3. To understand various data transfer techniques in digital computer.
4. To analyze processor performance improvement using instruction level parallelism

Course Outcomes

On successful completion of this course:

CO No	Course Objective Description
IMCA2C03.1	Students will be able to define the fundamental concepts of computers organization
IMCA2C03.2	Students will be able to understand the theory and architecture of computer and its fundamental parts including parallel processing and pipelining .
IMCA2C03.3	Students will be able to determine the coordination and the role of different components in the computer for a program execution
IMCA2C03.4	Students will be able to analyze and compare some of the design issues in terms of speed, technology, cost, performance.
IMCA2C03.5	Students will be able to evaluate the enhancement in the performance of computer by incorporating new concepts and technological developments

Detailed Syllabus:

Topic	Session	References
Module I **Introduction:** Basic structure of computers-Machine Instructions and programs: Memory Locations and addresses, Memory Operations, Instructions and Instruction sequencing,Addressing modes, Basic Input Output Operations, Subroutines.	1-9	Computer Organization, V C Hamacher
Module II Central Processing Unit: Basic Concepts - Instruction execution cycle - Sequencing of control signals - Hardwired control . Microprogrammed control - Control signals - Microinstructions- Microprogram sequencing - Branch address modification- Pre fetching of microinstructions	10-16	Computer Organization, V C Hamacher
Module III The Main Memory: Memory Hierarchy – Main memory - RAM-ROM **.**Cache Memory – Performance Considerations.Virtual Memory- Memory Management Requirements– Memory interleaving	17-26	Computer Organization, V C Hamacher
Module IV **Input / Output Organization:** Accessing I/O devices - Interrupts: Interrupt processing – hardware interrupts –programmable interrupt controller Vectored Interrupts - Interrupt nesting - Daisy chaining.Direct memory access (DMA): DMA operations & DMA Controller.	27-34	Computer Organization, V C Hamacher
Module V Parallel Processing : Basic Parallel Processing Architecture . Flynn‟s Classification - SISD, MISD, SIMD, MIMD structures - Pipelining – Basic Concepts of pipelining, Instruction Pipelining, Hazards-Data Hazards, Instruction Hazards, Vector processing & Vector processors - Loosely Coupled & Tightly Coupled Systems.	35-42	Computer System Architecture – M Morris Mano

Recommended Books & Reading List

1. Computer Organization, V C Hamacher, Mc-Graw Hill International Edition, Fifth Edition.
2. Computer Architecture: A Quantitative Approach - John Hennessy and David Patterson, Morgan Kaufmann Publishers Inc., Third Edition
3. Computer System Architecture – M Morris Mano –(Prentice Hall)- Third Edition.
4. Computer Organization and Architecture- William Stallings - Fifth Edition.
5. Structured Computer Education – Andrew S Tanenbaum-(Prentice Hall)-Fourth Edition.

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IMCA2C04 DATA STRUCTURES- C

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2C04
Course Title	Data Structures- C
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

The course focuses on the logical structures of data and their physical representation. It introduces the concept of design of algorithms and their complexity. It will review elementary data structures such as arrays, linked lists, stacks, queues, and related algorithms for manipulating the data structures. It will also explore more advanced data structures such as graphs and graph algorithms, balanced trees, and heaps. It covers in detail the different sorting and searching techniques and their complexity.

Course Objectives

By the end of the course the students will be able to:

1. To analyze the performance of the algorithm in terms of their time and space complexity.
2. To implement linked lists using arrays and pointer variables.
3. To differentiate the types of data structures and their applications in real world.
4. Be familiar with the concept of trees, tree traversals and graph representations.
5. To implement various sorting and searching algorithms

Course Outcomes

On successful completion of this course:

CO.No	Course Objective Description
IMCA2C04.1	Students will be able to list the different types of data structures in C.
IMCA2C04.2	Students will be able to describe and explain the different data structures and their operations.
IMCA2C04.3	Students will be able to apply the data structures concepts learned to solve various real-world problems.
IMCA2C04.4	Students will have the ability to design algorithms for manipulating various data structures
IMCA2C04.5	Students will be able to analyze the different sorting and searching techniques.

Detailed Syllabus:

Topic	Session	References
MODULE I Introduction: Algorithmic notation, Introduction to algorithm analysis for time and space requirements. **Arrays:** Ordered lists – polynomial addition, sparse matrices, representation of array	1-8	Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)
MODULE II Stacks and Queues: Definition and concepts, Operations on stacks. Application of stacks-recursion, polish expressions and their compilation, Queue, representation of queue, circular queue, deque, priority queue, Application of queues	9-16	Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)
MODULE III Linked List: Singly linked list, Linked stacks, and queues, Polynomial addition, Equivalence relation, sparse matrices, doubly linked list Dynamic storage management, Garbage collection and compaction. Strings – data representation for strings, Pattern matching in strings.	17-25	Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)
MODULE IV Trees: Basic terminology, binary trees, binary tree representation, Binary tree traversal, threaded binary trees, binary tree representation of trees, Application of trees – Set representation, Balanced Trees-B Tree. **Graphs**: Terminology and representation, Traversals.	26-32	Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)
MODULE V Internal Sorting and External Sorting: Searching – Linear search, binary search, and interpolation search. Comparison of different methods. **Sorting** – Insertion, Bubble, Selection, Radix sort. Sorting with disks - K way merging, Run generation. **Hashing Techniques**: Different hashing functions, methods for collision handling	33-40	Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)

Recommended Books & Reading List

1.Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)
2.An introduction to data structures with applications – Jean Paul Tremblay, paul G Sorenson(Tata McGraw Hill)
3.Data Structures – E.M Reingald , W Hamen (CBS Publishers and distributors)
4,Data Structures – a psedocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn.
5.Data Structures and program design – R. L Kruse (Prentice Hall of India)
6.Data structures using C – Tanenbaum and Augustine (Prentice Hall of India)
7.Theory and problems of data structures – Seymour lipschutz (Tata McGraw Hill)
8.Data structures and Algorithms in C++, Adam Drozdek, Thomson Learning, 3 Edn
9.Classic data structures – D Samanta (PHI)
10. Data Structures through C in Depth – S.K. Srivastava, Deepali Srivastava, BPB Publications

IMCA2C05 OBJECT ORIENTED PROGRAMMING WITH C++

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2C05
Course Title	Object Oriented Programming with C++
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

This course introduces the students to object oriented programming with C++. C++ is a widely used programming language for application development. The fundamental concepts of the object-oriented paradigm are introduced, and object-oriented programming is stressed in place of traditional structured programming. It covers in detail concepts such as classes and objects, abstraction, polymorphism, overloading, inheritance, exception handling and template classes.

Course Objectives

By the end of the course the students will be able to:

1. Master object-oriented concepts and the syntax of C++ Language.
2. Write reusable C++ code.
3. Develop the ability to design programs using Object Oriented Concepts.
4. Be able to handle exceptions occurring in programs.

Course Outcomes

On successful completion of this course:

CO.No	Course Objective Description
IMCA2C05.1	Students will be able to list and define the basic concepts of object-oriented programming
IMCA2C05.2	Students will be able to explain the usage of different program elements in C++.
IMCA2C05.3	Students will be able to apply the concepts learned and generate fault tolerant code.
IMCA2C05.4	Students will be able to write programs by applying the various oops concepts.
IMCA2C05.5	Students will be able to analyze real world problems and create extensible, reusable code.

Detailed Syllabus:

Topic	Session	References
ModuleI Introduction to Object-Oriented Programming: Evolution of programming methodologies. Procedural Approach Vs Object-Oriented Approach. Basic Concepts and Benefits of OOP. **Objects and Classes:** Access Specifiers. Memory Allocation for Objects, Inline functions, Friend Functions and Friend Classes.Static Data Members; Static Member Functions. const Member Functions, this pointer. Comparison of class with structure. Arrays of Objects; Objects as Function Arguments;	1-7	Mastering C++ by K.R Venugopal, Rajkumar,
String Manipulation using objects	8	A Structured Programming Approach Using C++, Forouzan,
ModuleII Constructors and Destructors: Purpose of Constructors and Destructors. Default Constructors, Constructors with & without parameters, Constructor Overloading, Copy Constructor. Invoking Constructors and Destructors. **Pointers in C++ :** Pointer declaration and Access, Pointer to void, pointer and arrays, memory management – new and delete, pointer to object, self-referencing class, wild pointers.	9-16	Mastering C++ by K.R Venugopal, Rajkumar
ModuleIII Polymorphism: Overloading Concepts, Function Overloading: Operator Overloading: Defining Operator Function, Rules for overloading Operators. Overloading unary operators, overloading binary operators, Overloading << and >> Operators for Objects, Overloading [], (), new, delete Operators. Type Conversions – Basic to Class, Class to Basic and One class to another class type.	17-24	Mastering C++ by K.R Venugopal, Rajkumar
ModuleIV Inheritance: Basic Concepts, Reusability & Extensibility. Defining derived classes, protected access specified in Base class constructors and destructors in derived classes – Types of Inheritances, Virtual Base Classes. **Virtual Functions:** Normal member functions accessed with pointers, virtual member function access, late binding, pure virtual function, abstract classes.	25-32	Mastering C++ by K.R Venugopal, Rajkumar
ModuleV Console I/O operations: C++ stream classes – Predefined Objects, unformatted I/O operations, Formatted I/O operations. **Disk I/O Operations:** Stream Classes, classes for file stream operations, opening and closing a file, file nodes, writing an object to disk, reading an object from disk, binary versus character files, I/O with multiple objects, tellg() and seekg(), seekp() and tellp(). Error Handling During File Operations. **Templates:** Generic Functions- A generic swap function, Functions with more than one Generic Type, Overloading a Function Template, Class templates, Template Restrictions, The power of Templates. **Exception Handling:** Fundamentals of Exception Handling, Catching Class Types, Using Multiple catch statements, Catching All Exception, Restricting	33-42	Mastering C++ by K.R Venugopal, Rajkumar

Exception, throw statement, Setting the Terminate and Unexpected Handlers, Uncaught exception.		

Recommended Books & Reading List

1. K.R Venugopal Rajkumar, Mastering C++ , TMH.
2. Computer Science: A Structured Programming Approach Using C++, Forouzan, Thomson Learning , 2 Edn
3. Deitel & Deitel, C++ How to program, Pearson Education Asia, 7th Edition, 2010.
4. C++ Programming: Malik, Thomson Learning , 3 Edn
5. Gaddis Tony, Starting Out with C++, dreamtech Press,
6. Sotter A Nicholas and Kleper J Scott, Professional C++, Wiley Publishing Inc.
7. Schildt Herbert, The Complete Reference C++, Tata McGraw Hill, 4th Edition

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IMCA2P06 DATA STRUCTURES-C PRACTICALS

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2P06
Course Title	Data Structures- C Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

The main objective of the course is to introduce the students to the fundamentals of Data structures using C programming language and to increase their intuitive understanding of basic concepts. It aims to improve a student's Problem-solving ability by laying emphasis on formulating problems. The knowledge of Data Structures and Algorithms vastly improves the student's ability to store and manipulate data.

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Course Objectives

By the end of the course the students will be able to:

1. Be able to formulate a problem by examining a situation.
2. Is adept in selecting appropriate data structures required for a problem thus saving computer memory.
3. Have a good knowledge of the various storage structures used for linear as well as non-linear Data Structures.
4. Can improve the performance of sorting methods by selecting an appropriate Data Structure.

Course Outcomes

On successful completion of this course:

Sl.No	Description
IMCA2P06.1	Students will be able to represent data in various formats including an array, linked list, trees etc.
IMCA2P06.2	Students will be able to describe various data structures along with how to manipulate them.
IMCA2P06.3	Students will be able to solve various real-world problems by applying the data structure concepts.
IMCA2P06.4	Students will be able to write programs to show the working of various data structures
IMCA2P06.5	Students will be able to analyze and simulate various sorting and searching techniques

Detailed Syllabus:

Topic	Session	References
1. Program to represent Sparse Matrix manipulation using arrays.	1-5	
2. Program to represent Stack operations using array and pointers.	6-9	
3. Program to represent Evaluation of Expressions.	10	
4. Program to represent Conversion of infix to postfix.	11-12	
5. Program to represent Queue operations using array and pointers.	13-14	
6. Program to represent Singly Linked List.	15-16	
7. Program to represent Linked Stacks.	17-18	
8. Program to represent Linked Queues.	19-20	
9. Program to represent Circular Linked List	21-22	
10, Program to represent Doubly Linked List.	23-24	
11.Program to represent String operations.	25-28	
12. Program to represent Binary Tree Operations.	29-30	
13. Program to represent Binary Tree Traversals.	31-32	
14. Program to represent Searching procedures (Linear search, Binary search and Interpolation search)	33-35	
15. Program to represent Sorting procedures (Selection, Bubble , Insertion)	36-40	

Recommended Books & Reading List

1. Fundamentals of data structures – Ellis Horowitz and Sartaj Sahni (Galgotia)
2. An introduction to data structures with applications – Jean Paul Tremblay, paul G Sorenson(Tata McGraw Hill)
3. Data Structures – E.M Reingald , W Hamen (CBS Publishers and distributors)
4. Data Structures – a psedocode approach with C –Richard F Gilberg, Behrouz A Forouzan, Thomson Learning, 2 Edn.
5. Data Structures and program design – R. L Kruse (Prentice Hall of India)
6. Data structures using C – Tanenbaum and Augustine (Prentice Hall of India)
7. Theory and problems of data structures – Seymour lipschutz (Tata McGraw Hill)
8. Data structures and Algorithms in C++, Adam Drozdek, Thomson Learning, 3 Edn
9. Classic data structures – D Samanta (PHI)
10. Data Structures through C in Depth – S.K. Srivastava, Deepali Srivastava, BPB Publications

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IMCA2P07 C++ PRACTICALS

Course Overview

Program	IMCA
Semester	2
Course Code	IMCA2P07
Course Title	C++ Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

The main objective of the course is to introduce the students to the fundamentals of C ++ programming language and to increase their understanding of basic concepts of oops. It aims to improve a student's problem-solving ability by laying emphasis on solving real world problems using object-oriented techniques. They study the syntax and semantics of C++ programming language and learn how to create extensible, reusable, manageable software

Course Objectives

By the end of the course the students will be able to:

1. Create user defined datatypes using classes and objects.
2. Write C++ programs using all major features of C++ Language like inheritance, encapsulation, exception handling.
3. Understand the importance of reuse of code.
4. Create fault tolerant code.

Course Outcomes

On successful completion of this course :

Sl.No	Description
IMCA2P07.1	Students will be able to define the basic program elements of c++ programming language.
IMCA2P07.2	Students will be able to explain the different concepts of oops incorporated in a program.
IMCA2P07.3	Students will be able to apply object-oriented programming concepts to develop reusable program elements.
IMCA2P07.4	Students will be able to solve problems of varying natures using different program constructs.
IMCA2P07.5	Students will be able to analyze problems encountered in everyday life, decide on the functionality required and create programs to solve it.

Detailed Syllabus:

Topic	Session	References
1. Program to Implement Classes and Objects.	1-5	
2.Program to Implement Constructors and Destructors with array of Objects.	6-8	
3. Program to Implement Passing objects as parameters and returning objects.	9-10	
4. Program to demonstrate Function Overloading.	11-12	
5. Program to overload different operators – incr & decr operators with post & pre forms; new, delete, [], () and arithmetic operators.	13-16	
6. Program to perform dynamic memory allocation using pointers.	17-19	
7. Program to demonstrate friend functions and friend classes.	20-23	
8. Program using objects for String manipulation functions.	24-25	
9. Program to implement different types of inheritances.	26-28	
10. Program to demonstrate the use of Virtual Functions.	29	
11. Program to demonstrate the use of abstract classes.	30	
12. Program to demonstrate I/O streams and functions.	31	
13. Program to Overload << and >> operators as a member and as a non-member operator functions.	32	
14. Program to create a file to store some records and search for a record and display it.	33-34	
15. Program to perform all possible Type Conversions.	35-37	
16. Program to create function Templates and overload the function Templates.	38-39	
17. Program to create a generic stack class and member functions to perform stack operations.	40	
18. Program to implement Exception Handling with minimum 5 exception classes.	41-42	

Recommended Books & Reading List

1. K.R Venugopal Rajkumar, Mastering C++ , TMH.
2. Computer Science: A Structured Programming Approach Using C++, Forouzan, Thomson Learning , 2 Edn
3. Deitel & Deitel, C++ How to program, Pearson Education Asia, 7th Edition, 2010.
4. C++ Programming: Malik, Thomson Learning , 3 Edn
5. Gaddis Tony, Starting Out with C++, dreamtech Press,
6. Sotter A Nicholas and Kleper J Scott, Professional C++, Wiley Publishing Inc.
7. Schildt Herbert, The Complete Reference C++, Tata McGraw Hill, 4th Edition

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Semester III

IMCA3C01 MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3C01
Course Title	Mathematical Foundation of Computer Science
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

The course Mathematical Foundations of Computer Science aims to explain the underlying concepts and tools in Discrete Mathematics with emphasis on their applications to Computer Science. It emphasizes mathematical definitions and applicable methods. The course contents include Sets, Relations, Functions, Logic and the basics of Graph Theory and Trees.

Course Objectives

By the end of the course the students will be able to:

1. To familiarize the students with the definitions and notations used in the theory of Sets, Relations, Functions, Logic, Graphs and Trees.
2. To enable the student to apply the key operations and concepts of the theory of Sets, Relations, Functions, Logic, Graphs and Trees to solve problems.

Course Outcomes

On successful completion of this course:

CO.No	Course Objective Description
IMCA3C01.1	Students will be able to define the important terms used in the various topics included in the course
IMCA3C01.2	Students will be able to demonstrate an understanding of relations and functions and be able to determine their properties, compositions and inverses.
IMCA3C01.3	Students will be able to apply the operations of Sets, rules of inference graph theory and trees to solve applied problems
IMCA3C01.4	Students will have the ability to create a mathematical model of a real-world problem using the concepts of Sets or Graphs.
IMCA3C01.5	Students will have the ability to evaluate a real world problem using the concepts of Sets or Graphs .

Detailed Syllabus:

Topic	Session	References
Module I Set Theory- Definition, representation, types of sets, set operations, laws of set theory(statement only), Principle of Inclusion and Exclusion . Relations –representation of relations as matrices and digraphs, properties of relations- reflexive, symmetric, transitive, equivalence and partial ordering, inverse and composition of relationsFunctions-Injective, surjective and bijective functions, inverse and composition of functions	1-9	Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R Manohar
Module II Logic- Propositions and Connectives,Tautology and Contradiction.Logical Implications and Equivalences. Theory of Inference of Statement Calculus- proof by direct method, contradiction and conditional proof.	10-18	Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R Manohar
ModuleIII Graph Theory Basic terminology: Different types of graphs – Directed and undirected, Simple, Pseudo, Complete, Regular, Bipartite. Incidence and degree, Pendant and Isolated vertex and Null graph. Matrix Representation of graphs – Incidence and Adjacency matrices. Isomorphism and Sub graphs	29-27	Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R Manohar
ModuleIV Euler & Hamiltonian Graphs :Walk, Path and Circuit, Connected and disconnected graphs and components, Operations on graphs. Euler Graphs, Fleury's Algorithm,Hamiltonian circuits and paths. Traveling salesman problem.	30-36	Graph Theory by Narsingh Deo
ModuleV Trees- Rooted Tree, Binary tree, Binary search tree.Tree traversals- preorder, post order and inorder traversals.Spanning tree- depth first and breadth first search	37-41	Discrete Mathematics and Its Applications by Kenneth H Rosen

Recommended Books & Reading List

1. Discrete Mathematical Structures with Applications to Computer Science by J. P. Tremblay and R Manohar, Tata McGraw-Hill Publications, 1997.
2. Graph Theory by Narsingh Deo, Prentice-Hall of India publications, 2004. Malik, Thomson Learning , I Edn.
3. Discrete Mathematics for Computer Science, Haggard, Thomson Learning , I Edn.
4. Discrete Mathematics and Its Applications by Kenneth H Rosen. Tata McGraw-Hill Publications.
5. Mathematical foundation of Computer Science by Y. N Sings. New Age international Publishers.
6. Bernard Kolman, Robert.C.Busby & sharon Ross, "Discrete Mathematical structures" Prentice Hall of India, 2001.

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IMCA3C02 MANAGEMENT INFORMATION SYSTEMS

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3C02
Course Title	Management Information Systems
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Computer application is an area where students needs exposure to information systems and their use in Management. In todays world information systems play a very crucial role in helping the Management in taking the right decision at the right time specially in this highly competitive environment. This paper gives an insight into technology, systems approach, management practices and the decision-making process.

Course Objectives

By the end of the course the students will be able to :

1. Understand technology
2. Understand various type of systems and the concept of organizational systems
3. Explain the concept of management
4. Develop a systems approach thinking
5. Understand various types of decision making

Course Outcomes

On successful completion of this course:

CO.No	Course Objective Description
IMCA3C02.1	Identify technologies and their applications
IMCA3C02.2	Systems approach and application of technology
IMCA3C02.3	Levels of decision making and choosing and building a design of the appropriate information system.
IMCA3C02.4	Various levels of management and their role in decision making process.
IMCA3C02.5	Design a structure of an information system based on the problem.

Detailed Syllabus:

Topic	Session	References
Module I Digital Firm-Concepts, Definition, Role, Control System, Management Support, Management Effectiveness, Digital Firm. E-Business and E-Commerce, System Concepts, Feedback and Control, Corporate Planning, Types of strategies, Business Planning, Balance Score Card, Strategic Business Planning. Security Challenges- threats and vulnerabilities, controlling threats, disaster management, information security.	1-10	Management Information Systems, Waman S Jawadekar, 4th Edition, McGraw Hill .
Module II DSS, Decision Analysis, Organizational Decision Making, concepts on information, Information Classification, Knowledge and Knowledge management. Business Intelligence, Expert Systems. System Analysis, General Model of MIS, Need and role of System Analysis, System development Model, OOA, SSAD, OOSAD Development Life Cycle. Development process of MIS, Process Model.	11-20	Management Information Systems, Waman S Jawadekar, 4th Edition, McGraw Hill Management Information System, Laudon, Laudon & Dass, 11th Edition, Pearson Education
ModuleIII Business Process Re-engineering, Value Stream Model, MIS and BPR. DSS, GDSS, Knowledge Management Systems, DSS in E-enterprises, Enterprise Management System, ERP, SCM, CRM, EMS and MIS.	21-27	Management Information Systems, Waman S Jawadekar, 4th Edition, McGraw Hill Information system for Modern management, Murdick, Rose & Cloggett, PHI Publications.
ModuleIV Technology of IS - Data Processing, Transaction Processing, OLAP, TQM, Networks - Topology, Data Communication, Unified Communications, Components of UC, WiMAX. Database- Database Models, Database Design, RDBMS, Client-Server Architecture and implementation strategies. Data Warehouse, Architecture of Data Warehouse, Implementation.	28-34	Management Information Systems, Waman S Jawadekar, 4th Edition, McGraw Hill
ModuleV E-Business, Internet and WWW, E-Commerce, categories of E-Commerce, Electronic payment Systems, Content Management Systems, Enterprise Portal, Security in e - business, privacy issues, Tools for security management, Systems Control and Audit, Global MIS - Outsourcing and Off shoring, Global Business strategies.	35-40	Management Information Systems, Waman S Jawadekar, 4th Edition, McGraw Hill

Recommended Books & Reading List

1. Management Information Systems, Waman S Jawadekar, 4thEdition, McGraw Hill
2. Management Information Systems, O'Brien, Marakas and Behl, 9th Edition, Tata Mcgraw Hill Publication.
3. Management Information System, Laudon, Laudon & Dass, 11th Edition, Pearson Education
4. Management Information System, Davis & Olson, Tata McgrawHill Publication.
5. Information system for Modern management, Murdick, Rose & Cloggett, PHI Publications.

IMCA3C03 DBMS AND NO SQL

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3C03
Course Title	DBMS and NoSql
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

The course exposes the student to the fundamental concepts and techniques in database use and development as well provides a foundation for research in databases. It reviews topics such as conceptual data modeling, relational data model, relational query languages, relational database design, transaction processing and NoSQL.

Course Objectives

By the end of the course the students will be able to:

1. Introduces the basic concepts of a database system and query language.
2. Emphasizes the understanding of the fundamentals of relational database systems including data models, database architectures, database manipulations and normalization.
3. Provides an understanding of new developments and trends such as distributed database, replication, fragmentation and NoSQL.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA3C03.1	Students will be able to define the architecture and functioning of Database Management Systems. They can also describes how aggregates manifest themselves in data models in NoSQL
IMCA3C03.2	Students will be able to illustrate the techniques for controlling the consequences of concurrent data access and crash recovery.
IMCA3C03.3	Students will be able to apply normalization techniques to develop a good database design.
IMCA3C03.4	Students will have the ability to create and maintain a relational database using SQL and its advanced features.
IMCA3C03.5	Students will be able to summarize different applications of DBMS.

Detailed Syllabus:

Topic	Session	References
Module I Overview of Database Systems: A Historical Perspective, Files System versus a DBMS, Advantages of a DBMS. Describing and Storing Data in a DBMS : The Relational Model, Levels of Abstraction in a DBMS, Data Independence. Structure of a DBMS.**Introduction to Database Design**: Entities, Attributes and Entity Sets. Relationship and relationship sets. Additional Features of the ER Model.	1-7	Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003.
Module II Relational Model: Introduction to the Relational Model. Integrity Constraints over Relations: Primary Key, Foreign Key and General Constraints. E-R Model to Relational Model: Entity Sets to Tables, Relationship Sets to Tables, Translating Relationship Sets with Key Constraints. Translating Relationship Sets with Participation Constraints, Translating Weak Entity Sets.	8-14	Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003.
ModuleIII Structured Query Language Overview of SQL, Basic Queries in SQL, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, String and Date Functions, Complex Integrity Constraints in SQL, Triggers and Views in SQL, Embedded SQL, Dynamic SQL and Cursors.**Relational Database Design** Introduction to Schema Refinement, Functional Dependencies, Normal Forms: First Normal Form, Second Normal Form, Third Normal Form, Boyce Codd Normal Form.	15-25	Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003.
ModuleIV Transaction Management, Concurrency Control, Distributed System - The ACID Properties of a Transaction, Concurrent Execution of Transactions: Serialisability, Anomalies Due to Interleaved Execution, Schedules Involving Aborted Transactions, Lock-Based Concurrency Control: Strict Two-Phase Locking (Strict 2PL), Deadlocks. Introduction to Crash Recovery: Stealing Frames and Forcing pages, overview of ARIES. Dealing with Deadlocks. **Introduction to Distributed Database** - Distributed DBMS Architectures, Storing data in a Distributed Databases: Replication, Fragmentation.	26-32	Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003.
ModuleV Nosql Data Management - Introduction to NoSQL- Four types of NoSQL Databases - Aggregate data models - Aggregates – Key-Value and Document Data Models – Relationships – Graph Databases – Schemaless Databases – Materialized views – Distribution Models – Sharding – Master-Slave Replication – Peer-Peer Replication.	34-40	P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012

Recommended Books & Reading List

1. Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, Third Edition, McGraw Hill, 2003.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Database Systems: Design, Implementation and Management, Peter Rob, Thomson Learning, 7Edn.
4. Concept of Database Management, Pratt, Thomson Learning, 5Edn.
5. Database System Concepts , Silberchatz, Korth and Sudarsan, Fifth Edition, McGraw Hill, 2006
6. The Complete Reference SQL, James R Groff and Paul N Weinberg, Second Edition, Tata McGraw Hill, 2003.

IMCA3C04 PRINCIPLES OF MANAGEMENT

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3C04
Course Title	Principles of Management
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

The course Principles of Management aims to provide basic knowledge about business domain and basic guidelines for managing an organization. Course discuss about various management functions to be performed in business firms.

Course Objectives

By the end of the course the students will be able to:

1. Get insights into basic knowledge of Management theories and principles.
2. To make the students aware of basic concept of business functions and working environment.
3. To acquire knowledge about HR systems & procedures adopted for performance appraisal.
4. Understand and analyze the phases in recruitment process.
5. Acquire knowledge in various marketing techniques.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA3C04.1	Students will be able to know about the guiding principles and theories of Management
IMCA3C04.2	Students will be able to understand the core functions of Management.
IMCA3C04.3	Students will be able to apply the stages of recruitment in different organization.
IMCA3C04.4	Students will be able to customize & suggest appropriate performance appraisal system for the organisation.
IMCA3C04.5	Students will be able to evaluate the pros and cons of applying various marketing strategies.

Detailed Syllabus:

Topic	Session	References
Module I **Introduction** : Basic Managerial Concepts, Levels of management, managerial skills.Concept of management principles, nature and need of management.Management functions.Management thought – classical approach Scientific management, fayol's management.Bureaucratic approach, systems approach, Contingency approach.	1-9	Principles of Management, R N Gupta, S.Chand & Company Ltd. -Principles of Management, L M Prasad, Sultan ChandPublications -Management Theory & practice ,J S Chandan
Module II **Planning & Organising** Planning – Meaning, nature, structure, steps, effective planning.MBO, SWOT Analysis. Organizing – meaning, process, structure. Formal and informal, types of organization.Departmentation, delegation of authority.	10-16	Essentials of Management – Koontz & Wheinrich, 7th Edition, PHI Publications -Principles of Management, R N Gupta, S.Chand & Company Ltd. -Principles of Management, L M Prasad, Sultan Chand Publications -Management Theory & practice ,J S Chandan
ModuleIII **Staffing & Communication.** Staffing – meaning, nature.Staffing process, recruitment & selection. Directing, supervision.Motivation – significance, motivational theories- Maslow's need hierarchy, McGregor's Theory X & Theory Y. Leadership.Communication – formal and informal, Oral and written, barriers, effective communication. Controlling-concepts, steps, objectives, features of a good control system.	17-27	Essentials of Management – Koontz & Wheinrich, 7th Edition, PHI Publications -Principles of Management, R N Gupta, S.Chand & Company Ltd. -Principles of Management, L M Prasad, Sultan Chand Publications -Management Theory & practice ,J S Chandan
ModuleIV **Organizational Behavior** Organizational behavior – Key elements, scope. Models of OB, Individual behavior.Personality, attitudes values and job satisfaction.Group behavior.Team building- Types, process, roles.	28-34	Organisational Behavior, S.S Khanka, S.Chand & Company Ltd
ModuleV **Marketing Management** Marketing Management-mportance, scope. Core Marketing Concepts, Marketing research.Customer value, Customer relationship management.Brand Equity.Product Life Cycle, Pricing Strategies.Distribution Channels, Promotions – Sales promotions, advertising and public relations. Marketing Information System.	35-40	Marketing management – Kotler, Keller, Jha and Koshy, 13th edition, Pearson Education -Principles of Management, R N Gupta, S.Chand & Company Ltd.

Recommended Books & Reading List

1. Management Theory & practice ,J S Chandan
2. Principles of Management, R N Gupta, S.Chand & Company Ltd.
3. Essentials of Management – Koontz & Wheinrich, 7th Edition, PHI Publications
4. Principles of Management, L M Prasad, Sultan Chand Publications
5. Organisational Behavior, S.S Khanka, S.Chand & Company Ltd
6. Marketing management – Kotler, Keller, Jha and Koshy, 13th edition, Pearson Education

IMCA3C05 VISUAL PROGRAMMING(C#.NET)

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3C05
Course Title	Visual Programming (C#.NET)
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

This course provides a comprehensive introduction to Visual Programming Tools using C#.NET. By the end of the course, the student should be able to easily understand all the major aspects of Visual Programming Tools and C# language .The students will get familiar with MS Sql as the backend of the application At the end of the course they use C# language to produce their own windows based applications with Database Connectivity.

Course Objectives

By the end of the course the students will be able to:

1. Be familiar with Visual studio.net Framework
2. Be familiar with C# Language.
3. Develop windows applications.
4. Create applications with database connectivity.
5. Be familiar with creation of web based applications

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA3C05.1	Students will be able to list all the tools and features of visual studio framework.
IMCA3C05.2	Students will be competent to use the visual studio framework and ms sql database.
IMCA3C05.3	Students will be able to justify the usage of different tools to create windows-based applications.
IMCA3C05.4	Students will be able to design and develop applications with database connectivity by the use of C#.net language.
IMCA3C05.5	Students will be able to test and maintain the applications created in visual studio framework with MS SQL as data base.

Detailed Syllabus:

Topic	Session	References
Module I The C# Environment: Origins of .Net Technology, .NET Framework, Common Language Runtime. Overview of C#: Simple C# program, Namespaces, Comments, Command line arguments, Main with a class, Interactive input.	1-7	E Balagurusamy," Programming with C#", (TMH)
Module II Literals, Variables and Data Types - Operators and Expressions - Decision making and branching - Decision making and Looping.Methods in C# - Handling Arrays - Manipulating Strings: Creating strings, string methods, inserting strings, comparing strings, mutable strings, arrays of strings.	8-14	E Balagurusamy," Programming with C#", (TMH)
ModuleIII Classes and Objects: introduction, basic principles of OOP. defining a class, adding variables, methods, member access modifiers, creating objects, accessing class members ,constructors, overloaded constructors, static members, copy constructors,destructors,member initialization, this reference, nesting of classes, constant members. Inheritance and Polymorphism –Interface - Operator Overloading - Delegates and Events - Managing Errorsand Exceptions	15-21	E Balagurusamy," Programming with C#", (TMH)
ModuleIV WindowsApplication:Event-driven program model,classes used in windows application,textbox and label controls,button control,checkbox control,radiobutton control,groupbox control,Listbox control,checkedlistbox control,combobox control,monthcalendar control. Menu control, dialog box..	23-27	CMuthu,**"**VisualC#.Net"
ModuleV DatabaseConnectivity:Introduction,advantages of ADO.net,managed Providers,Developing simple ADO.net based application,Creation of Data table,Retrieving data from Tables,Table Updation,Disconnected data Access through Dataset object.Basic web controls: Introduction,Advantages of ASP.Net, ASP.Net object model, Server side controls, server side processing of client side events, creating the first ASP.Net page	28-40	CMuthu,**"**VisualC#.Net"

Recommended Books & Reading List

1. E Balagurusamy," Programming with C#", (TMH)
2. C Muthu,**"**VisualC#.Net"

IMCA3P06 DBMS PRACTICAL (ORACLE & MONGODB)

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3P06
Course Title	DBMS Practical (ORACLE & Mongodb)
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

The course presents an introduction to ORACLE and MongoDB with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course Objectives

By the end of the course the students will be able to:

1. Provide an introduction to ORACLE and MongoDB, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.
2. Introduces queries to insert data, update, delete and fetch the data from the tables.
3. Describe merging of tables using aggregate functions, nested queries, clauses to filter and sort the data, has been covered in detail.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA3P06.1	Students will be able to understand the working of DBMS.
IMCA3P06.2	Students will be able to Create and alter table structures using ORACLE.
IMCA3P06.3	Students will be able to Build subqueries to extract rows from processed data.
IMCA3P06.4	Students will be able to formulate queries to perform Insert, update and delete, select and rollback operations in a database.
IMCA3P06.5	Students will be able to create and manipulate collections in Mongodb and perform various operations.

Detailed Syllabus:

Topic	Session
Module I **Building a database: Table by table** a) Table creation with constraints(primary key, referential integrity constraints, not null, check constraints and unique constraints) b) Display a table's structure. c) Create Index. d) Drop and Truncate table. e) Listing all tables. f) Altering the table structure.	1-7
Module II **Data manipulation language (DML) commands** a) Row insertion, deletion and updating. b) Save using COMMIT. c) Inserting Table rows with a subquery. d) Restoring table contents (Rollback). **Basic SELECT statements** a) Simple select query b) Using arithmetic operators in SQL statements c) Using DISTINCT statement. d) Selecting rows with conditional restrictions (>,<, =, <>, >=, <=, BETWEEN, IN, ALL, LIKE, IS NULL / IS NOT NULL) e) SELECT with Logical Operators (AND, OR and NOT).	8-16
ModuleIII **Advanced SELECT Statements** a) Sorting Data - ORDER BY b) Aggregate Functions – COUNT, MIN ,MAX SUM ,AVG c) SELECT with GROUP BY & HAVING clause. d) Subqueries – Nested Queries (IN, ALL, ANY, SOME) e) Create & Drop View. Create & Replace complex Data types. Insert and select data to and from complex data types.	17-23

ModuleIV **Joining database tables & SQL Functions** **Joining Tables** a) Left outer join b) Right outer join c) Full Outer Join d) EXISTS and NOT EXISTS e) Union, Intersect, and Difference (Except) **SQL Functions** a) Numeric Functions(ABS, ROUND, TRUN, SQRT, MOD) b) String Functions(CONCAT, UPPER/LOWER, SUBSTR,)	24-32
ModuleV **NoSQL – MongoDB** a) Create & Drop database in Mongodb, b) Create collection and Drop collection, c) Insert, Find, and Update & Delete documents. d) Find with Projection, e) Sorting, Indexing & Create Backup	33-40

Recommended Books & Reading List

1. ORACLE DATABASE 11G, THE COMPLETE REFERE by LONEY and KEVIN, McGraw Hill
2. **SQL & Pl/SQL for Oracle 11g Black Book,Dr.P.S Deshpande, Wiley publication**
3. MongoDb: The Definitive Guide, Second Edition by Kristina Chodorow, O'Reilly Media publication; Second edition (June 4, 2013)

IMCA3P07 VISUAL PROGRAMMING PRACTICALS

Course Overview

Program	IMCA
Semester	3
Course Code	IMCA3P07
Course Title	Visual Programming Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

This course provides an in-depth knowledge of Visual Studio Framework using C#.NET. By the end of the course, the student should be able to easily develop windows based application in visual studio framework using C# language and MS SQL as back end .The students will also be able to develop a basic web application in Visual Studio Framework at the end of the course.

Course Objectives

By the end of the course the students will be able to:

1. Get in-depth knowledge of Visual studio.net Framework
2. Get in-depth knowledge of C# Language.
3. Able to develop windows applications.
4. Create applications with database connectivity.
5. Be familiar with creation of web based applications

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA3P07.1	Students will be familiar with all the tools and features of visual studio framework.
IMCA3P07.2	Students will be competent to use the visual studio framework and ms sql database.
IMCA3P07.3	Students will be able to justify the usage of different tools to create windows-based applications and also in-depth knowledge about MS SQL Database.
IMCA3P07.4	Students will be able to design and develop applications with database connectivity by the use of C#.net language.
IMCA3P07.5	Students will be able to test and maintain the applications created in visual studio framework with MS SQL as data base.

Detailed Syllabus:

Topic	Session
1.Create a program in C# to demonstrate command line arguments. 2.Create a program in C# to demonstrate pass by value and pass by reference 3. Create a program in C# to demonstrate two dimensional array. 4. Create a program in C# to demonstrate jagged array. 5. Create a program in C# to demonstrate method overloading. 6. Create a program in C# to demonstrate string manipulations.	1-7
7. Create a program in C# to demonstrate classes and objects. 8. Create a program in C# to demonstrate constructor overloading. 9.Create a program in C# to demonstrate nesting of classes. 10. Create a program in C# to demonstrate multilevel inheritance.	8-18
11. Create a program in C# to demonstrate hierarchical inheritance. 12. Create a program in C# to demonstrate method overriding. 13. Create a program in C#to demonstrate abstract classes and abstract methods. 14. Create a program in C# to demonstrate interfaces. 15. Create a program in C# to demonstrate operator overloading. 16. Create a program in C# to demonstrate delegates and events	16-27
17. Create a program in C# to demonstrate exception handling. 18. Create a program in C# to demonstrate windows forms application. 19.Create a program in C# to demonstrate database application using ADO.Net. 20. Create a program in C# to demonstrate web application using ASP.Net	27-40

Recommended Books & Reading List

1. E Balagurusamy," Programming with C#", (TMH)
2. CMuthu,**"**VisualC#.Net"

Semester IV

IMCA4C01 TECHNICAL COMMUNICATION

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4C01
Course Title	Technical Communication
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course

Course Description

This course is designed according to the changing language needs of the students and makes them 'industry-ready in terms of language and presentation skills. It is an introduction to technical and professional writing. It mainly focuses on basic principles of good writing and on types of documents common in scientific and technical fields and organizations. The purpose of technical communication is to help the target audience understand the subject quickly and complete a task correctly. While the emphasis is on writing, oral communication in varied formal and informal context forms an important component of the course. It helps the students to accomplish a task by explaining what they need to do and how to do it.

Course Objectives

By the end of the course the students will be able to:

1. Understand the dynamics of Communication in the Technical world.
2. Expose to the different forms of Business communication.
3. Develop oral and written communication skills.
4. Understand functional grammar and style of writing.
5. Understand different reading and listening strategies.
6. Equip different skills to face interviews, Group Discussions &presentation.

Course Outcomes

On successful completion of the course, the students will be able to:

CO.No	Course Outcome Description
IMCA4C01.1	Students will be able to understand the dynamics of communication in the technical world.
IMCA4C01.2	Students will be able to apply grammatically accurate sentences.
IMCA4C01.3	Students will be able to develop corporate skills needed for employment in the industry.
IMCA4C01.4	Students will be able to explain events, processes, and situations
IMCA4C01.5	tudents will be able to create a job application along with CV.

Detailed Syllabus

Topic	Session	References
Module I Nature of Technical Communication:Stages of communication, Channels of communication, Technical communication skills, Barriers to effective communication. Types of communication. Style in Technical Communication:Technical style, ABC of Technical Communication, Objectivity in Technical Communication	1-8	Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company, 2007 (ETC) (pages 1-20,34- 50)
Module II Reading- Reading activities (Skimming, Scanning, Note making), Critical Reading - Finding key information in a given text, Reading and interpreting a visual material. **Writing**- Free writing on a given topic. Describe People, Places, Incidents, General and Specific description of various objects. **Speaking-** Introducing oneself, Speaking in Formal situation (teachers, officials, foreigners). Telephone skills – Telephone etiquette. **Grammar-** Parts of Speech ,Tenses	13-23	Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company.
Module III Reading- Reading and language comprehension, Reading different kinds of texts. **Writing-** Writing Effective Sentences- Sentence Structure, Types of Sentences. Dialogue Writing. **Speaking** - Group Interaction, Responding to questions. **Grammar-** Subject Verb Agreement, Clauses, Phrases, Idioms, Framing questions.	24-31	Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company, 2007 (ETC)(pgs. 222, 323 – 332)
Module IV Reading - Reading Method **Writing** - Letter Writing Skills, Personal and Business Letters, Letters of Inquiry, Letters Placing Orders, Complaint and Adjustment Letters. **Speaking** - Group Discussion (Group Discussion Strategies **Grammar** - Prefixes, Suffixes, Word Formation, Compound Words, Word Association, Synonyms and Antonyms. If conditional Clause	32-35	Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company, 2007 (ETC)(pgs.253,176- 179

Module V Reading: Reading and Interpreting Graphic Information. Writing - E-mail Messages Resumes and Job Application Speaking - Professional Speaking -Job Interviews Grammar - Active Voice & Passive Voice, Direct and Indirect Speech.	36-40	Rizvi, M. Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company, 2007 (ETC) (pgs. 139- 164,256-257,391-422,441-451)

References:

1. V.Sasikumar, P.Kiranmai Dutt and Geetha Rajeevan,. “Communication Skills in English” Cambridge University Press and Mahatma Gandhi University.
2. A Course in Reading Skills for Academic Purposes by Glendinning, Eric H. and BeverlyHolmstrom
3. Communication Studies by Sky Massan
4. Course in Spoken English for Academic Purposes by Anderson, Kenneth, Joan Maclean and Tony Lynch
5. A textbook of ENGLISH PHONETICS for Indian students – T. Balasubramanian.

IMCA4C02 JAVA

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4C02
Course Title	JAVA
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

This course introduces computer programming using the JAVA programming language with object-oriented programming principles. It also introduce the students to use java swing and jdbc to create robust console and GUI applications.

Course Objectives

By the end of the course the students will be able to:

1 Write, compile and execute Java programs
2 Build robust applications using Java's object-oriented features
3 Create robust applications using Java class libraries
4 Develop platform-independent GUIs
5 Read and write data using Java streams

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4C02.1	Students will be able Define the basic fundamentals of JAVA
IMCA4C02.2	Students will be able to Differentiate between C , C++ , JAVA
IMCA4C02.3	Students will be able to Apply Oops concepts in JAVA
IMCA4C02.4	Students will be able to Create GUI application using JAVA SWING and establish database connection using JDBC
IMCA4C02.5	Students will be able to explain the concept of multiple inheritance using interfaces

Detailed Syllabus:

Topic	Session	References
Module I Introduction to Java Programming: Basic concepts of Object oriented programming , Java history, Java Features, How java differs from C and C++ , Java Virtual Machine , Java Program structure , Variables , Data types, Operators , Reading Console input and Writing Console output , Control structures , Arrays , Strings	1-7	Programming With Java, E . Balagurusamy.
Module II Object oriented Programming: Classes and Objects , Access Specifiers , Methods, Method overloading, Static members , inheritance , method overriding , Abstract Classes and Wrapper Classes, final , super and this keyword. Packages : Creating Packages , Accessing a package , Using a package, Adding a class to a Package. Interfaces: Defining interface , Extending interface , Implementing interface	8-15	Programming With Java, E . Balagurusamy.
ModuleIII Exception handling: the concept of exceptions , types of exceptions , syntax of exception handling , Multiple catch statements , Using finally statement, user defined exceptions. Threads: Thread life cycle , Creating Threads - Extending the thread class and Implementing the Runnable interface, Thread priority , Synchronization. Input/Output in java : Stream classes ,Byte stream classes , Character stream classes, Reading/writing characters , Reading/writing bytes, Random access files.	16-26	Programming With Java, E . Balagurusamy.
ModuleIV Applets : Applet life cycle , The Applet Tag , Adding Applet to HTML file , Running the Applet , Passing parameters to Applets. The Graphics class: Drawing and filling shapes (Lines, Rectangles , Arcs , Oval). AWT: Awt classes , Window fundamentals, closing AWT Window or Frame , Layout managers , Event handling – delegation event model , event classes ,Sources,Listeners.	27-33	Programming With Java, E . Balagurusamy.
ModuleV Java Swing: Swing Package and classes , Components and Containers , Text Input, Choice components, Menus and Dialog Boxes. JDBC: JDBC Architecture , Types of JDBC drivers , Establishing Connection interface , Types of Statement objects (Statement , Prepared statement and Callable statement) , ResultSet , Rowset , Transactions (inserting , updating and deleting records)	34-40	The Complete Reference JAVA by Herbert Schildt, TMH Publication.

Recommended Books & Reading List

1. Programming With Java, E . Balagurusamy, Mc Graw Hill Education.
2. The Complete Reference JAVA by Herbert Schildt, TMH Publication.

IMCA4E01(a) ELECTIVE I- CLIENT SERVER COMPUTING

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4E01(a)
Course Title	Client Server Computing
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

Client Server Computing Model defines the way successful organizations will use technology during the next decade. As a result knowledge of client server architecture has become an essential part of computer science. The main objective is to provide the basic concepts of client server computing and the new technologies involved in it.

Course Objectives

By the end of the course the students will be able to:

1. To introduce the client server architecture and fundamentals of distributed systems.
2. To understand Distributed Systems, distributed computing environment
3. Familiar with Distributed computing environment

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4E01(a).1	Students will be able to define the underlying concepts in client server development using common access databases
IMCA4E01(a).2	Students will be able to examine the techniques which are required to develop network application/ internet based application.
IMCA4E01(a).3	Students will be able to differentiate between two-tier and three-tier architectures.
IMCA4E01(a).4	Students will be able to design and Set up a client /server environment using LAN and WAN Scenarios.
IMCA4E01(a).5	Students will be able to analyze the concept of middleware, and communication protocols. Needs

Detailed Syllabus:

Topic	Session	References
Module I Overview of C/S Computing: Definition, Benefits & Evolution, Hardware & Software, Trends, Evolution of operating systems, networking trends. Overview of C/S applications: components, classes, categories. Overview of C/S computing: Dispelling the Myths, Obstacles- Upfront and hidden, open systems and standards, Standards setting organizations, factors of success.	1-8	Tanenbaum and Van Steen, Distributed Systems Principles and Paradigam Pearson Education, 2005 Dawna Travis Dewire , Client Server Computing, McGraw Hill International
Module II Client hardware and software: Client components and operating systems. What is GUI?,Xwindow vs. windowing, database access. Application logic client software products: GUI environments, converting 3270/5250 screens, Database access tools. Client requirements: GUI design standards, Open GUI standards, Interface dependents, testing interfaces, development aides.	9-17	Tanenbaum and Van Steen, Distributed Systems Principles and Paradigam Pearson Education, 2005 Dawna Travis Dewire , Client Server Computing, McGraw Hill International
ModuleIII Server hardware: Benchmarks, categories of servers, features and classes of server machines. Server Environment: eight layers of software, network management and computing environments, extensions, Network operating systems, loadable modules. Server operating systems: OS/2, Windows new technology, UNIX based operating systems.	18-25	Tanenbaum and Van Steen, Distributed Systems Principles and Paradigam Pearson Education, 2005 Dawna Travis Dewire , Client Server Computing, McGraw Hill International
ModuleIV Server Requirements: Platform independence, transaction processing, connectivity, intelligent database, stored procedures, Triggers,Load Leveling, Optimizer, testing and diagnostics tools, real ability backup and recovery mechanisms.	26-36	Tanenbaum and Van Steen, Distributed Systems Principles and Paradigam Pearson Education, 2005 Dawna Travis Dewire , Client Server Computing, McGraw Hill International
ModuleV Server data management and access tools: Data manager features, data management software. Database gateways. LAN hardware and software, Network Operating Systems	37-40	Tanenbaum and Van Steen, Distributed Systems Principles and Paradigam Pearson Education, 2005 Dawna Travis Dewire , Client Server Computing, McGraw Hill International

Recommended Books & Reading List

1. Dawna Travis Dewire , Client Server Computing, McGraw Hill International
2. Tanenbaum and Van Steen, Distributed Systems Principles and Paradigam Pearson Education, 2005
3. Orfali,Harkey and Edwards, The Essential Client server Survival guide, 2Nd edition Galgotia, 2003
4. Jeffrey.D.Schan, C/S Application and Architecture, Novell Press, BPB
5. Joe Salami, Guide to C/S Databases, Bpb Publn., 1994 7. David Vaskevitch , Client Server Strategies, Galgotia, 1994

IMCA4E01(b) ELECTIVE I-PARALLEL PROCESSING

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4E01(b)
Course Title	Parallel Processing
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course will cover a range of topics involved in designing and programming parallel architectures. The course will focus on the most common type of parallel machines: shared and distributed memory multi-processor systems.The course will also cover other parallel machines and programming paradigms including data-flow, vector processing, and multi-threaded architectures.

Course Objectives

By the end of the course the students will be able to:

1. Be familiar with Parallel Processing concepts
2. Define terminology commonly used in parallel computing, such as *efficiency* and *speedup*.
3. Describe different parallel architectures, inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4E01(b).1	Students will be able to list all terminology commonly used in parallel computing
IMCA4E01(b).2	Students will become familiar with different parallel architectures
IMCA4E01(b).3	Students will be able to justify the use of parallel processing algorithms
IMCA4E01(b).4	Students will be able to design parallel systems
IMCA4E01(b).5	Students will be able to analyze the different parallel processing architectures

Detailed Syllabus:

Topic	Session	References
Module I Introduction to parallel Processing, Evolution of Computer Systems, Parallelism in Uniprocessor systems,Parallel Computer Structures, Architectural Classification Schemes, Parallel processing Applications.	1-5	Computer Architecture & Parallel Processing By Kai Hwang & Faye A. Briggs. McGraw Hill International Editions.
Module II Pipelining: An overlapped parallelism, Instruction and Arithmetic Pipelines, Principles of Designing Pipelined Processors.Vector Processor Requirements, Pipeline Computers and Vectorization Methods, Pipeline chaining and Vector loops, Vectorization and Optimization Methods.	5-11	Computer Architecture & Parallel Processing By Kai Hwang & Faye A. Briggs. McGraw Hill International Editions.
ModuleIII SIMD Array Processors, SIMD Interconnection Networks, Parallel Algorithms for Array Processors,Associative Array Processing – Associative Memory Organizations	12-23	Computer Architecture & Parallel Processing By Kai Hwang & Faye A. Briggs. McGraw Hill International Editions.
ModuleIV Multiprocessor Architecture and Programming, Functional Structures, Interconnection Network .Inter-process Communication Mechanisms, System Deadlock and Protection.	24-27	Computer Architecture & Parallel Processing By Kai Hwang & Faye A. Briggs. McGraw Hill International Editions
ModuleV Data Flow Computers Data Driven Computing and Languages, Data Flow Computer Architectures	28-40	Computer Architecture & Parallel Processing By Kai Hwang & Faye A. Briggs. McGraw Hill International Editions

Recommended Books & Reading List

1. Computer Architecture & Parallel Processing By Kai Hwang & Faye A. Briggs. McGraw Hill International Editions.
2. Advanced Computer Architecture Parallelism, Scability & Programmability by Kai Hwang, McGraw Hill International Editions
3. Modern Computer Architecture By Rafiquzzaman & Chandra, Galgotia.
4. Perspectives in Computer Architecture by P.V.S. Rao, PHI.

IMCA4E01(c) ELECTIVE I- ENTERPRISE RESOURCE PLANNING

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4E01 (c)
Course Title	Enterprise Resource Planning
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course will introduce you to enterprise systems and show how organizations use enterprise systems to run their operations more efficiently and effectively. You will learn about the critical success factors and implementation strategies that lead to enterprise system success, and about the informational, knowledge, and decision-making opportunities afforded by enterprise systems. By this learners learns about Fundamentals of enterprise resource planning (ERP) systems concepts, and the importance of integrated information systems in an organization. The focus of this course is on illustrating procurement, production, and sales business processes using ERP software.

Course Objectives

By the end of the course the students will be able to:

1. Understanding of the fundamental concepts of ERP systems, their architecture, and working of different modules, technologies and implementation and post implementation activities of in ERP.
2. Students will also able to understand the present trends and future developments in the field of Enterprise resource planning.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4E01(c).1	Understand the fundamental concepts of ERP systems.
IMCA4E01(c).2	Understand the Technologies used and Business modules of ERP systems.
IMCA4E01(c).3	To Learn about different implementation phases of ERP Software solutions
IMCA4E01(c).4	To Learn about post implementation process of ERP Software solutions
IMCA4E01(c).5	Understand emerging and trends in ERP Systems through various case studies related to ERP Systems.

Detailed Syllabus:

Topic	Session	References
Module I **Introduction to ERP:** Need for ERP, History of ERP.Justifying ERP Investment, Risks and Benefits of ERP. ERP-The Indian scenario, ERP Vendors.	1-7	Rajesh Ray, Enterprise Resource Planning, McGraw Hill Education (India) Pvt Ltd.
Module II **ERP Business modules and Related technologies:** ERP Business modules- Financial, Manufacturing, HR Management, Plant Maintenance, Material Management.Quality Management, Marketing, Sales, Distribution and other services. Related Technologies.Business Intelligence and Business Analytics, E-commerce and E-Business.	8-16	Alexis Leon, ERP Demystified, McGraw Hill Education (India) Pvt Ltd., Third edition.
ModuleIII **ERP Implementation:** Implementation challenges.ERP Implementation strategies, ERP Implementation life cycle.Implementation methodologies, ERP deployment methods.	16-26	Alexis Leon, ERP Demystified, McGraw Hill Education (India) Pvt Ltd., Third edition.
ModuleIV **ERP Post Implementation:** Post-Implementation Activities, Employees and Employee resistance,Contracts with vendors-consultants.Employees, Trainings and Education.Data Migration, Project Management and Monitoring.Success and Failure factors of an ERP Implementation.	27-33	Alexis Leon, ERP Demystified, McGraw Hill Education (India) Pvt Ltd., Third edition.
ModuleV **ERP Present and Future:** ERP for Manufacturing Industries - ERP for Service Industries - Enterprise Application Integration (EAI).ERP and Total Quality Management (TQM) - Future Directions and trends in ERP. ERP and security. Case Study - Oracle ERP implementation at Maruti Suzuki	34-40	Alexis Leon, ERP Demystified, McGraw Hill Education (India) Pvt Ltd., Third edition.

Recommended Books & Reading List

1. Rajesh Ray, Enterprise Resource Planning, McGraw Hill Education (India) Pvt Ltd.
2. Alexis Leon, ERP Demystified, McGraw Hill Education (India) Pvt Ltd., Third edition.
3. Alexis Leon, Enterprise Resource Planning, McGraw Hill Education (India) Pvt Ltd., Fourth edition.
4. ERP and Supply Chain Management by Christian N. Madu, Publisher: CHI

IMCA4C03 SYSTEM SOFTWARE

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4C03
Course Title	System Software
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Introduce the concept of finite automata and terminologies related to it like DFA, NDFA, Turing machines. To make students understand the design concepts of various system software like Assembler, Linker, Loader and Macro pre-processor, Utility Programs such as Text Editor and debugger.

Course Objectives

By the end of the course the students will be able to:

1. Distinguish different software into different categories.
2. Design, analyze and implement one pass, two pass or multi pass assembler.
3. Ddesign, analyze and implement loader and linker.
4. Design, analyze and implement macro processors.
5. Critique the features of modern editing

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4C03.1	Students will be able to understand Finite state automata, DFA, NDFA, loaders, linkers, macroprocessors.
IMCA4C03.2	Students will be able to know structure of assemblers in detail.
IMCA4C03.3	Students will be able to apply data structures into design of various types of system software components.
IMCA4C03.4	Students will be able to analyze algorithms to fine tune them.
IMCA4C03.5	Students will be able to design a editor.

Detailed Syllabus:

Topic	Session	References
Module I FINITE AUTOMATA- Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA &NDFA – Regular languages- Regular Expression – Equivalence of NFA and DFA – – Equivalence of finite Automaton and regular expressions – Minimization of DFA- – Pumping Lemma for Regular sets. Grammar- Types of Grammar – Context Free Grammars and Languages– Derivations and Languages. Turing Machines - Definitions of Turing machines – Models – Computable languages and functions –Techniques for Turing machine construction – Multi head and Multi tape Turing Machines.	1-10	Leland L. Beck, "System Software – An Introduction to Systems Programming", Pearson Education Asia. Peter Linz, "An Introduction to Formal Language and Automata", Third Edition, Narosa Publishers, New Delhi.
Module II INTRODUCTION - System software and machine architecture - The Simplified Instructional Computer (SIC) Machine architecture - Data and instruction formats - addressing modes - Instruction sets - I/O and programming	8-15	Leland L. Beck, "System Software – An Introduction to Systems Programming", Pearson Education Asia.
ModuleIII ASSEMBLERS - Basic assembler functions- A simple SIC assembler –Assembler algorithm and data structures -Machine dependent assembler features -Instruction formats and addressing modes –Program relocation -Machine independent assembler features -Literals –Symbol-defining statements – Expressions -One pass assemblers and Multi pass assemblers - Implementation example -MASM assembler.	16-25	D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill. John J. Donovan "Systems Programming", Tata McGraw - Hill Edition.
ModuleIV LOADERS AND LINKERS- Basic loader functions- Design of an Absolute Loader –A Simple Bootstrap Loader - Machine dependent loader features -Relocation –Program Linking –Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search –Loader Options -Loader design options -Linkage editors –Dynamic Linking –Bootstrap Loaders -Implementation example- MSDOS linker	26-31	John J. Donovan "Systems Programming", Tata McGraw - Hill Edition. Leland L. Beck, "System Software – An Introduction to Systems Programming", Pearson Education Asia.
ModuleV MACRO PROCESSORS- Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures -Machine-independent macro processor features -Concatenation of Macro Parameters –Generation of Unique Labels –Conditional Macro Expansion –Keyword Macro Parameters-Macro within Macro. SYSTEM SOFTWARE TOOLS- Text editors -Overview of the Editing Process -User Interface – Editor Structure. -Interactive debugging systems- Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria	32-40	D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill. John J. Donovan "Systems Programming", Tata McGraw - Hill Edition.

Recommended Books & Reading List

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, Pearson Education Asia.
2. D. M. Dhamdhere, “Systems Programming and Operating Systems”, Second Revised Edition, Tata McGraw-Hill.
3. John J. Donovan “Systems Programming”, Tata McGraw - Hill Edition.
4. Mishra K L P and Chandrasekaran N, “Theory of Computer Science – Automata,
5. Languages and Computation”, Third Edition, Prentice Hall of India
6. Harry R Lewis and Christos H Papadimitriou, “Elements of the Theory of Computation”,
7. Second Edition, Prentice Hall of India, Pearson Education, New Delhi.
8. Peter Linz, “An Introduction to Formal Language and Automata”, Third Edition, Narosa Publishers, New Delhi.

IMCA4C04 E-Commerce

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4C04
Course Title	E-Commerce
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course focuses on principles of e-commerce from a business perspective, providing an overview of business and technology topics, business models, virtual value chains and social innovation and marketing strategies. In addition, some of the major issues associated with e-commerce—security, privacy, intellectual property rights, authentication, encryption, acceptable use policies, and legal liabilities—will be explored. Students will build their own web presence and market it using an online platform.

Course Objectives

By the end of the course the students will be able to:

1. Understand the concept of e-commerce
2. Fair idea on the infrastructure required from e-commerce
3. Evaluating servers and tools for maintaining e-commerce sites.
4. Understanding security, copy right issues, Intellectual property and payment systems
5. Understanding intelligent agents, online advertisements etc.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4C04.1	Students will have knowledge on E-commerce, business models, revenue models, technologies related to e-commerce, EDI, EFTS and other technical terms.
IMCA4C04.2	Students will have knowledge on Ecommerce revolution and its impact in business, design methodology of website, factors to be considered in design, security and promotional aspects. How to evaluate various aspects of a e-commerce site. Copyright intellectual property rights etc..
IMCA4C04.3	Students will have knowledge on various available technologies and structures available. List the advantages and disadvantages of having business on the web. Traditional vs. modern business models. Security approaches etc.
IMCA4C04.4	Students will have knowledge on the various methods to design evaluate and test a e-commerce website.
IMCA4C04.5	Students will have knowledge on a list of factors which would help an organization to design and host a efficient and effective website and also evaluate the performance of the website with adequate security measures.

Detailed Syllabus:

Topic	Session	Reference
Module I:INTRODUCTION to e-commerce -Traditional vs E commerce – categories of e-commerce – Understanding E-commerce infrastructure. Web client/server architecture – intranet and extranets.	1-8	Ravi Kalakota, " Electronic Commerce", Pearson Education, Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.
Module II:E-COMMERCE MODELS – Brokerage model, Aggregator model, Info-mediary model, Community model, Value chain model, Manufacturer model, Advertising model, Subscription model.	9-17	Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.
Module III:WEB BASED TOOLS FOR E COMMERCE Web server – performance evaluation - web server software feature sets – web server software and tools – web protocol – search engines – intelligent agents – EC software – web hosting – cost analysis	18-26	Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.
Module IV:SECURITY Computer security classification – copy right and Intellectual property – electronic commerce threats – protecting client computers – electronic payment systems– electronic cash – strategies for marketing – sales and promotion – cryptography – authentication.	27-33	Efraim Turvan J.Lee, David kug and chung, "Electronic commerce" Pearson Education Asia 2001. Brenda Kienew E commerce Business Prentice Hall, 2001.
Module V:INTELLIGENT AGENTS Definition and capabilities – limitation of agents – security – web based marketing search engines and Directory registration – online advertisements – Portables and info - mechanics, website design issues.	34-40	Brenda Kienew E commerce Business Prentice Hall, 2001.

Recommended Books & Reading List

1. Ravi Kalakota, " Electronic Commerce", Pearson Education,
2. Gary P Schneider "Electronic commerce", Thomson learning & James T Peny Cambridge USA, 2001.
3. Manlyn Greenstein and Miklos "Electronic commerce" McGraw-Hill, 2002.
4. Efraim Turvan J.Lee, David kug and chung, "Electronic commerce" Pearson Education Asia 2001.
5. Brenda Kienew E commerce Business Prentice Hall, 2001.

IMCA4P05 JAVA PRACTICALS

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4P05
Course Title	JAVA Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

In this hands-on course, students gain extensive experience with Java and its object-oriented features. Students learn to create robust console and GUI applications and store and retrieve data from relational databases.

Course Objectives

By the end of the course the students will be able to:

1 Students will learn how to Write, compile and execute Java programs
2 Build robust applications using Java's object-oriented features
3 Create robust applications using Java class libraries
4 Develop platform-independent GUIs
5 Read and write data using Java streams
6 Retrieve data from a relational database with JDBC

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4P05.1	Students will be able to define the basic fundamentals of JAVA
IMCA4P05.2	Students will be able to differentiate between C , C++ , JAVA
IMCA4P05.3	Students will be able to apply Oops concepts in JAVA
IMCA4P05.4	Students will be able to develop GUI application using JAVA SWING and establish database connection using JDBC
IMCA4P05.5	Students will be able to explain the concept of multiple inheritance using Interfaces

Detailed Syllabus:

Topic	Session	References
Module I a) Simple programs to improve the logics using Control structures , Arrays, Strings (6 numbers) b) Programs to illustrate class, objects and constructors (2numbers)	1-7	
Module II a) Programs to implement polymorphism - overloading, overriding.(2 numbers) b) Programs to implement the usage of packages (2 numbers) c) Programs to implement inheritance(3numbers) d) Program to implement multiple inheritance using interfaces(1number)	8-16	
ModuleIII a) Programs to implement exception handling(3 numbers) b) Programs to Implement the concept of thread Programming (3 numbers) c) Programs for handling file operation (3 numbers)	17-23	
ModuleIV a) Applet Programs for passing parameters and applying graphics (3 numbers) b) Programs to implement AWT Components (4 numbers)	24-32	
ModuleV a) Programs for event-driven paradigm in Java (2 numbers) b) Programs to implement Java Swing components(3 numbers) c) Simple programs on JDBC(2 numbers) d) Develop a Product Management System using Swing and JDBC(Small Application) (1 number)	33-40	

Recommended Books & Reading List

1. Programming With Java, E . Balagurusamy, Mc Graw Hill Education.
2. The Complete Reference JAVA by Herbert Schildt, TMH Publication.

IMCA4P06 RDBMS PRACTICALS

Course Overview

Program	IMCA
Semester	4
Course Code	IMCA4P06
Course Title	RDBMS Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

This course focuses on the concepts and structures necessary to design and implement a relational database management system, mainly emphasizes on the integrity constraints and normalization techniques in RDMS. It also describes *the* techniques relating to ODBC and its implementations.

Course Objectives

By the end of the course the students will be able to:

1. Implement relational databases using a RDBMS
2. To emphasize the importance of normalization in databases.
3. To present the concepts and techniques relating to ODBC and its implementations
4. To present SQL and procedural interfaces to SQL comprehensively.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA4P06.1	Design and implement a database schema for a given problem-domain
IMCA4P06.2	Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS
IMCA4P06.3	Create a normalized database.
IMCA4P06.4	Design PL/SQL block
IMCA4P06.5	Implement ODBC techniques.

Detailed Syllabus:

Topic	Session
Table design using Foreign Key and Normalization Practice Transaction Control Language (TCL) commands (Grant, revoke, commit and save point options)	1-7
Usage of cursor, exception handling triggers, functions and Procedures using PL/SQL constructs.	8-18
Manage ODBC/JDBC connections	16-27
Development of sample applications using Oracle/MySQL as Back End. Sample applications may include Payroll Information ,Student Information System Bank Transaction ,Library Information System	27-40

Recommended Books & Reading List

4. ORACLE DATABASE 11G, THE COMPLETE REFERE by LONEY and KEVIN, McGraw Hill
5. *SQL & Pl/SQL for Oracle 11g Black Book,Dr.P.S Deshpande, Wiley publication.*
6. Mysql: The Complete Reference by VASWANI, McGraw Hill publication.1st edition, 2017
7. MySQL Explained: Your Step By Step Guide to Database Design by Mr. Andrew Comeau, CreateSpace Independent Publishing Platform; 2 edition (November 22, 2017).

Semester V

IMCA5C01 OPERATIONS RESEARCH

Course Overview

Program	IMCA
Semester	5
Course Code	IMCA5C01
Course Title	Operations Research
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Basic objective of this course is to understand the basic concepts in Operations research. It introduces students how a real life problem can be converted to a linear programming problem. It gives different methods to solve a LPP. It also gives the basic ideas in Queuing theory, Game theory and Network Analysis. It introduces the basic concepts in simulation.

Course Objectives

By the end of the course the students will be able to:

1. Understand the concepts in Linear Programming Problems and its optimization.
2. Understand the concepts of Game theory and Network analysis.
3. Understand the concepts in Queuing theory and simulation theory.

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA5C01.1	Students will be able to understand and reproduce the core concepts of optimization and also queuing theory.
IMCA5C01.2	Students will be able to understand the how a real world problem is related to LPP .
IMCA5C01.3	Students will be able to apply mathematical formulae to find the optimum values.
IMCA5C01.4	Students will have the ability to create a mathematical model from a real life problem.
IMCA5C01.5	Students will be able to evaluate optimum values.

Detailed Syllabus:

Topic	Session	References
Module I- Linear programming problems Mathematical formulation, graphical method of solution simplex method(Big M, two phase)	1-8	Kanthi Swaroop, Manmohan Gupta P K ,Operations Research,Schandh,2008
Module II- Duality in linear programming problems, dual simplex method, transportation, assignment problems, Traveling salesman Problem	9-20	Kanthi Swaroop, Manmohan Gupta P K ,Operations Research,Schandh,2008
Module III- Game theory Introduction, two-person zero-sum games, some basic terms, the maximin- minimax principle, games without saddle points-Mixed Strategies. Graphic solution of 2 *n and m*2 games, dominance property. CPM & PERT- project scheduling, critical path calculations	21-33	Kanthi Swaroop, Manmohan Gupta P K ,Operations Research,Schandh,2008
Module IV- Queueing theory Queuing systems, Elements of a queueing system, roles of the Poisson and exponential distributions, classification of queues, basic results of M/M/1: FIFO systems(Including problems).	34-39	Kanthi Swaroop, Manmohan Gupta P K ,Operations Research,Schandh,2008
Module V- Simulation: simulation concepts, simulation of a queuing system using event list pseudo random numbers, basic ideas of Monte-Carlo simulation(Including problems).	41-42 43-45	Kanthi Swaroop, Manmohan Gupta P K ,Operations Research,Schandh,2008

Recommended Books & Reading List

1) Taha.H.A ,operation Research : An Introduction, McMilan publishingcCo., 1982.7th ed.
2) Ravindran A, Philips D.T & Solbery.J.J, Operations Research:Principles and practice, John Wiley & Sons, New York, 1987.
3) Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
4) G.Srinivasan, Operations Research, Principles And Applications, Prentice Hall,2008
5) Kanthi Swaroop, Manmohan Gupta P K ,Operations Research,Schandh,2008

IMCA5C02 OPERATING SYSTEMS

Course Overview

Program	IMCA
Semester	5
Course Code	IMCA5C02
Course Title	Operating Systems
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

Course covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

Course Objectives

By the end of this course students will be able:

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. Students should be able to use system calls for managing processes, memory and the file system.
6. Students should understand the data structures and algorithms used to implement an OS.

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA5C02.1	Students will be able to understand and reproduce the concepts of Operating System.
IMCA5C02.2	Students will be able to develop the applications to run in parallel either using process or thread models of different OS
IMCA5C02.3	Students will be able to apply various device and resource management techniques for timesharing and distributed systems, Mutual exclusion, Deadlock detection and agreement protocols of Distributed OS.
IMCA5C02.4	Students will have the ability to Interpret the mechanisms adopted for file sharing in distributed Applications.
IMCA5C02.5	Students will have the ability to conceptualize the components involved in designing a contemporary OS

Detailed Syllabus:

Topic	Session	References
Module I **Introduction to Operating System:-** Operating system Architecture, Operating System Structure, Operating System Operations.Types of operating systems-Batch Operating System, Multi programming-Time sharing, Real time, distributed operating systems. Systems Structures: - Systems Components, Operating System Services.Systems Structures: - System Calls, System Programs, System Structures.	1-9	Abraham Silberschatz and Peter Baer Galvin, Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.
Module II **Process Management and Co-ordination:-**Process Concept-The process, process state, PCB, Threads. Process Scheduling:-Types of schedulers, scheduling and performance criteria, scheduling algorithms, multiple processor scheduling. Process synchronization -Concurrent Processes- critical section problem, mutual exclusion-mutual exclusion algorithms. semaphores. Deadlocks: -Definition –Deadlock characterization-Resource allocation graph, methods for handling deadlocks, deadlock prevention, deadlock avoidance-, Banker's algorithm.	10-19	Abraham Silberschatz and Peter Baer Galvin, Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.
Module III **Memory Management:-**Memory Management Strategies-Basic Hardware-address binding, dynamic loading, Swapping. Paging-Basic method-structure of page table- hardware support, shared pages. Segmentation- hardware, implementation of segment table, protection and sharing, fragmentation, segmentation with paging. Virtual Memory Management: - Demand paging –performance. Page replacement-page replacement algorithms. Thrashing, Segmentation and paging implementation of virtual memory.	20-27	Abraham Silberschatz and Peter Baer Galvin, Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.
Module IV **Storage Management:-**File System-File-system structure, File system implementation.Directory implementation- Allocation methods, and free space management.Secondary storage structure:-Overview, disk structure, disk structure, disk attachment, disk scheduling, disk management.	28-33	Abraham Silberschatz and Peter Baer Galvin, Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.
Module V **Distributed and Special purpose systems:-**Distributed Operating system-Types of network, network structure, network topology, communication structure, communication protocol. Real time systems-overview, system characteristics, features. Implementing RTOS.**Case Study -** Desktop OS - Mobile OS – Android and iOS	34-40	Abraham Silberschatz and Peter Baer Galvin, Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.

Recommended Books & Reading List

1. Abraham Silberschatz and Peter Baer Galvin, Greg Gange 'Operating System Concepts', (Sixth Edition) Wiley - India.
2. Milan Milenkovic 'Operating systems' TATA Mc GrawHill.
3. Andrew S. Tanenbaum, "Modern Operating System, Prentice Hall India
4. Learning Android OS – Oreilly Publishers
5. Learning iOS – Oreilly Publishers

IMCA5C03 WEB TECHNOLOGY

Course Overview

Program	IMCA
Semester	5
Course Code	IMCA5C03
Course Title	Web Technology
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

Basic objective of this course is to introduce the students to the basic concepts of web and to build basic and advanced web applications using various web programming languages. It also introduces students to one of the latest javascript framework to get an idea of using frameworks so as to make them industry ready.Students need not have prior familiarity with web programming, but they must have the basic knowledge of computer programming in order for this course to be successful.

Course Objectives

1. To understand the concepts of web and its protocols.
2. This course able the students to do web programming.
3. It also focuses on building HTML, CSS, javascript, AJAX, javascript with Angular.js applications, JSP with JDBC applications and Ruby on Rails applications.

Course Outcomes

On successful completion of this course :

CO.No	Course Outcome Description
IMCA5C03.1	Define the web programming concepts.
IMCA5C03.2	Students will be able to develop and explain the concepts related to web programming.
IMCA5C03.3	Students will be able to apply programming logic by implementing information to develop web applications.
IMCA5C03.4	Students have the ability to compare and test different web technologies.
IMCA5C03.5	Students will be able to develop and construct applications based on different web technologies.

Detailed Syllabus:

Topic	Session	References
Module I Introduction to web, connecting to internet – www – IP address, URL, DNS. Protocols governing the web – IP, TCP, HTTP, FTP, Telnet, Web applications – Architecture, Web application vs distributed application. Types of web application, writing web projects, Web team – Roles and responsibilities.	1-7	Tanweer Alam, "Introduction to Web Technology", Khanna Book Publishing. Xavier. C, "Web Technology and Design", New Age International.
Module II Web page designing: HTML, formatting and fonts, commenting code, anchors, backgrounds, images, hyperlinks, lists, tables, frames, HTML forms. Cascading style sheet (CSS): The need for CSS, Introduction to CSS, basic syntax and structure, inline styles, embedding style sheets, linking external style sheets, classes. XML: features, structures in XML, DTD, XML schemas, presenting and using XML.	8-21	Tanweer Alam, "Introduction to Web Technology", Khanna Book Publishing. Xavier. C, "Web Technology and Design", New Age International. Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition, McGraw Hill.
Module III Javascript – Introduction, core features, data types and variables, operators, expressions and statements, functions, objects, array, date and math related objects, document object model, event handling, controlling windows & frames and documents, form handling and validations. Introduction to AJAX – requests, response. Angular JS – Understanding Angular JS, overview of Angular JS lifecycle, integrating Angular JS with existing javascript, bootstrapping Angular JS in an HTML document, creating Angular JS application.	22-28	Kris Hadlock, "Ajax for Web Application Developers", SAMS Publishing. Thomas Powell, "Javascript: The Complete Reference", Tata McGraw-Hill. Brad Dayley, "Node.js, MongoDB, and Angular JS Web Development", Addison Wesley.
Module IV Java server pages (JSP) – installing and configuring apache tomcat web server, JSP overview, JSP syntax and semantics, expressions, scriptlets, implicit objects, declarations, page directives. Sessions, cookies, java beans, database access.	29-33	Jason Brittain, Ian F Darwin, "Tomcat The Definitive Guide", O'Reilly. Hans Bergsten, "Java Server Pages", O'Reilly. Phil Hanna, "JSP The Complete Reference", Osborne/McGraw-Hill.

Module V The Ruby language – Installing Ruby, working with numbers and strings, storing data in variables, creating constants, working with operators, arrays, conditionals, loops, methods, blocks. Classes and objects: Creating classes and objects, inheritance, overriding, variables, methods, modules, mixins. RAILS: Putting ruby on rails, introducing model-view-controller architecture, Building simple rails applications: Accessing data the user provides, connecting to databases.	34-42	Steven Holzner, "Beginning Ruby on Rails", Wiley Publishing.

Recommended Books & Reading List

1. Tanweer Alam, "Introduction to Web Technology", Khanna Book Publishing.
2. Xavier. C, "Web Technology and Design", New Age International.
3. Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition, McGraw Hill.
4. Kris Hadlock, "Ajax for Web Application Developers", SAMS Publishing.
5. Thomas Powell, "Javascript: The Complete Reference", Tata McGraw-Hill.
6. Brad Dayley, "Node.js, MongoDB, and Angular JS Web Development", Addison Wesley.
7. Jason Brittain, Ian F Darwin, "Tomcat The Definitive Guide", O'Reilly.
8. Hans Bergsten, "Java Server Pages", O'Reilly.
9. Phil Hanna, "JSP The Complete Reference", Osborne/McGraw-Hill.
10. Steven Holzner, "Beginning Ruby on Rails", Wiley Publishing.

IMCA5C04 OBJECT ORIENTED MODELING AND DESIGN

Course overview

Program	IMCA
Semester	5
Course Code	IMCA5C04
Course Title	Object oriented Modeling & Design
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course empathizes on the basic concepts and methodologies required to perform quality object-oriented software engineering. Students are also equipped with the knowledge of the Unified Modeling Language (UML) – the de facto standard for OO modeling. Furthermore, this course introduces the advanced topic of design patterns and familiarizes the students with some of the most commonly used creational, structural, and behavioral design patterns.

Course Objectives

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

1. Understand and learn the Object Oriented Concepts and their significance in software development.
2. Create, Critique and Refine customer Use Cases.
3. Transform Use Cases into Object Oriented software Realizations through OO Analysis and OO Design.
4. Document the requirements, analysis, and design models in the Unified Modeling Language (UML) notation.
5. Implement iterative and evolutionary way of development of Software Systems using Object Oriented concepts.

Course Outcomes

On successful completion of the course, the students will be able to:

CO.No	Course Objective Description
IMCA5C04.1	Define basic concepts, terms and principles of object-oriented analysis and design
IMCA5C04.2	Explain basic structure, behavior and architecture of modeling.
IMCA5C04.3	Illustrate the use of UML for object-oriented modeling.
IMCA5C04.4	Model an overall system using UML diagrams.
IMCA5C04.5	Evaluate various system development methodologies.

Detailed Syllabus

Topic	Session	Reference
MODULE I AN OVERVIEW OF OBJECT ORIENTED SYSTEMS DEVELOPMENT: Introduction, Two Orthogonal Views of the Software WHY WE MODEL: The Importance of Modeling, Principles of Modeling,Object Oriented Modeling INTRODUCING THE UML: An overview of the UML, A Conceptual Model of the UML, Architecture, Software Development Life Cycle.	1-10	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008.
MODULE II BASIC STRUCTURAL MODELING: Classes, Relationships, Common Mechanisms, and diagrams, class diagrams. ADVANCED STRUCTURAL MODELING: Advanced classes. advanced relationships, Interfaces, Types and Roles, Packages, Object Diagrams	11- 18	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008.
MODULE III BASIC BEHAVIORAL MODELING: Interactions, Interaction diagrams, Use cases, Use case diagrams, Activity Diagrams ADVANCED BEHAVIORAL MODELING: Events and signals, state machines, processes and Threads, Time and Space, Statechart Diagrams.	19-26	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008.
MODULE IV ARCHITECTURAL MODELING I: Components, Component diagrams, Deployment, Deployment diagrams, System Models	27-32	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008.
MODULE V CASE STUDY: Bank ATM Application, Railway Reservation System.	33-38	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008.

Recommended Books and Reading List

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007.
2. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008
3. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", 1stEdition, Pearson Education, 2006.
4. Pascal Roques, "Modeling Software Systems Using UML2", 1stEdition, WILEY Dreamtech, 2007.
5. Atul Kahate, "Object Oriented Analysis & Design", 1stEdition, TMH, 2007.
6. Mark Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, TMH, 2005.
7. Craig Larman, "Appling UML and Patterns: An introduction to Object", Oriented Analysis and Design and Unified Process, 3rd Edition, Pearson Education, 2007.

IMCA5C05 SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

Course Overview

Program	IMCA
Semester	5
Course Code	IMCA5C05
Course Title	Software Engineering And Project Management
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course provides an understanding of both theoretical and methodological issues involved in modern software engineering project management and focuses strongly on practical techniques. The scale and complexity of the software systems now being developed demands that software engineer's work in multi-functional teams and that they adopt scalable and robust methodologies and tools. This course will helps the students to develop the transferable skills in logical analysis, communication and project management necessary for working within team-based, professional environments.

Course Objectives

By the end of this course students will be able to

1. Understand the process of Software Engineering
2. Conceptualize the Software Development Life Cycle (SDLC) models.
3. Familiarize Project Management framework andTools

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA5C05.1	Students will be able to understand various software development techniques and methodologies
IMCA5C05.2	Students will be able to choose appropriate process model depending on the user requirements
IMCA5C05.3	Students will be able to Translate a requirement specification to a design using an appropriate software engineering methodology.
IMCA5C05.4	Syudents will be able to formulate appropriate testing strategy for the given software system
IMCA5C05.5	Students will be able to develop software projects based on current technology, by managing resources economically and keeping ethical values.

Detailed Syllabus:

Topic	Session	References
Module I Software and Software Engineering: The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice.Process Models: A Generic Process Model, Process Assessment and Improvement, Perspective Process Models, Specialized Process Models.	1-8	Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2010.
Module II Requirements Engineering, Developing Use Cases, Software Engineering Project Management: Major issues of Software Engineering. Functions and activities of Management, planning, organizing, staffing, directing and controlling a software Engineering Project.Project Evaluation: Strategic Assessment, technical assessment, Cost-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, Risk evaluation.	9-16	Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2010.
Module III Selection of an appropriate project approach: Choosing Technologies, technical plan contents list, choice of process models, structure versus speed of delivery. The Waterfall model, The V-process model, the spiral model, Software prototyping, other ways of categorizing software prototypes. Controlling changes during prototyping, incremental delivery. Dynamic systems development method, Extreme programming Managing iterative processes, selecting the most appropriate process model	17-24	Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2010.
Module IV Software Effort Estimation: Problems with over and under estimates. The basis for Software estimating, Software effort estimation techniques, expert judgment, estimating by analogy Albrecht function point analysis, function points Mark II, Object points, a procedural code –oriented approach, COCOMO: A Parametric Model.	25-33	Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2010.
Module V Activity planning: The objectives of activity planning, When to plan, Project Schedules, Projects and activities, Sequencing and scheduling activities. Risk Management: The nature of risk, types of risks, Managing Risk, Hazard Identification, Hazard Analysis, Risk planning and control, Evaluating risks to the schedule.	34-40	Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2010.
Microsoft Project Introduction	41	

Recommended Books & Reading List

1) Software Engineering – Roger S Pressman, 'Software Engineering: A Practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2010.

2) Richard Fairey, ‘Software Engineering concepts, Tata McGraw-Hill 2009 reprint
3) Software Project Management by Bob Hughes and Mike Cotterell, Tata McGraw-Hill Edition 2004.
4) Software Project Management- A unified framework by Walker Royce, Pearson Education, 2003.
5) Software Engineering-a Practitioner’s approach by Roger S Pressman, Sixth Edition, Tata McGraw Hill.
6) Software Management By Donald J Reifer, Sixth Edition, Wiley-IEEE Computer Society Press, 2002

IMCA5P06 PYTHON PROGRAMMING PRACTICALS

Course Overview

Program	IMCA
Semester	5
Course Code	IMCA5P06
Course Title	Python Programming Practicals
Type of Course	Core
Contact Hours	4 hour per week
Credit	2

Course Description

This course leads the students from the basics of writing and running Python scripts to more advanced features such as file operations, regular expressions and using the extensive functionality of Python modules. Extra emphasis is placed on features unique to Python, such as tuples, array slices, and output formatting.

Course Objectives

By the end of this course :

1. Students will be able to install and run the Python interpreter
2. Students will be able to create and execute Python Programs
3. Students will be able to understand the concept of file I/O and also the appropriate Python visualization libraries

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA5P06.1	Students will be able to identify the commonly used operations involving file systems and regular expressions.
IMCA5P06.2	Students will be able to articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.
IMCA5P06.3	Students will be able to apply a solution clearly and accurately in a program using Python.
IMCA5P06.4	Students will have the ability to determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets
IMCA5P06.5	Students will have the ability to demonstrate web application using python web Framework-Django

Detailed Syllabus:

Topic	Session	References
Module1 Introduction: What is Python, Origin, Comparison, Environment setup; Basic Syntax: Comments, Operators, Variables and Assignment, Data Types: Numbers, Strings, Lists Tuples, Dictionaries, Boolean, Set; Differentiate Mutable, Immutable datatypes. Python Standard Library ,Modes of Python Programming: Interactive, Script mode; Introduction to Python coding styles : Imperative, Functional, Objectoriented, and Procedural .Control Structures: Sequential, Selection (if, if else elif, nested ifelse),Iteration(while, for, nested loops),Loop control statements(break, continue, pass) User-Defined Functions, Parameter Passing.	1-8	LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012.
Module II Numbers: Integers and Boolean, Floating Point Numbers, Complex Numbers, None Strings: Declaration, use of escape sequence, Operations on strings: concatenation, Repetition, use of (in, not in), Slicing, Built-in String functions Lists: Construct a list, Derive from another list, use of range function, append to a list, access elements using index, loops with list, delete from list, list functions Tuples: Define tuple , indexing in tuples , add elements to a tuple , delete a tuple , slicing, Tuple functions Dictionaries: Create a dictionary, access dictionary elements, Delete elements, Append elements to a dictionary , update existing elements, Dictionary Functions	9-14	LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012. .
Module III Functions: Define a function, Calling a function , types of functions, function arguments, Global and local variables, Recursive function. Modules: Create a module, use a module, Renaming a module, Built-in modules, import from module, math module, random module,	15-20	LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012.
Module IV Object Oriented Programming: Classes and objects, Attributes, methods, constructors, destructors, Deleting Attributes and objects, Python Inheritance ,overloading, overriding, Abstraction, Encapsulation, Polymorphism, Containers Errors and Exceptions: Syntax errors, Exceptions, handling exceptions (try, except, else, finally), raising exceptions, user defined exceptions	21-30	LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012. .
Module V Python GUI: Basics of tkinter GUI Development (Widgets, geometry management, organising layouts & widgets), Event-Based tkinter Widgets. Python frameworks : Django (create dynamic web application with Database)	31-38	LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012.

Recommended Books & Reading List

1. LjubomirPerkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012.
2. Charles Dierbach, "Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", Wiley, 2013.
3. Allen B Downey, "Think Python" ,Oreilly, 2012

Lab Record Programs

All students are supposed to prepare a lab record (written/printed) with minimum30 programs including the mini project.

1. Develop programs based on control structures, functions and arrays (8)
2. Programs to implement the basic data structures using python(4)
3. Programs based on python data types(4)
4. Programs to implement functions (3)
5. Programs to implement Modules (2)
6. Programs to implement Object oriented concepts (6)
7. Programs to implement Exception handling(2)
8. Develop a Mini Project (Student Management System) using Django framework(1)

IMCA5P07 WEB TECHNOLOGY PRACTICALS

Course Overview

Program	IMCA
Semester	5
Course Code	IMCA5P07
Course Title	Web Technology Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

Basic objective of this course is to enable the students to build basic and advanced web applications using various web programming languages.Students need not have prior familiarity with web programming, but they must have the basic knowledge of computer programming in order for this course to be successful.

Course Objectives

By the end of this course students will be able:

1. To build basic web applications using HTML.
2. To enhance the web applications build using HTML with CSS.
3. To understand XML and performing validation of XML file using DTD and Schemas.
4. To create web applications using javascript.
5. To create web applications using JSP and using MySQL to build database applications.
6. To create web applications using Ruby and understanding its object oriented concepts.
7. Focusing on building Ruby on Rails applications.

Course Outcomes

On successful completion of this course :

CO.No	Course Outcome Description
IMCA5P07.1	Students will be able to define the web programming concepts.
IMCA5P07.2	Students will be able to develop and explain web programming.
IMCA5P07.3	Students will be able to apply programming logic to develop web applications.
IMCA5P07.4	Students have the ability to examine and test different web technologies.
IMCA5P07.5	Students will be able to design and construct applications based on different web technologies.

Detailed Syllabus:

Topic	Session
Create an HTML page to demonstrate lists and tables.	1-2
Create an HTML page using frames.	3-4
Create an image gallery using CSS.	5-6
Create an HTML form and style it using CSS.	7-8
Create an XML file and validate it using XML DTD.	9-10
Create an XML file and validate it using XML Schema.	11-12
Create javascript application using arrays and functions.	13-14
Create javascript application by implementing Date and Math related objects.	15-16
Create a javascript application that demonstrates form validation which includes text field, radio buttons, check boxes, list box and other controls.	17-21
Create a web application using JSP.	22-23
Create a JSP application to demonstrate sessions.	24-25
Create a JSP application to demonstrate cookies.	26-27
Create a database application using JSP and MySQL.	28-30
Create a JSP application to demonstrate java beans.	31-32
Create a ruby program to demonstrate classes and objects.	33
Create a ruby program to demonstrate inheritance.	34-35
Create a ruby program to demonstrate overriding.	36
Create a ruby program to demonstrate modules.	37
Create a ruby program to demonstrate mixins.	38-39
Create a database application using Rails.	40-42

Recommended Books & Reading List

1. Tanweer Alam, “Introduction to Web Technology“, Khanna Book Publishing.
2. Xavier. C, “Web Technology and Design”, New Age International.
3. Thomas A. Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, McGraw Hill.
4. Kris Hadlock, “Ajax for Web Application Developers”, SAMS Publishing.
5. Thomas Powell, “Javascript: The Complete Reference”, Tata McGraw-Hill.
6. Brad Dayley, “Node.js, MongoDB, and Angular JS Web Development”, Addison Wesley.
7. Jason Brittain, Ian F Darwin, “Tomcat The Definitive Guide”, O’Reilly.
8. Hans Bergsten, “Java Server Pages”, O’Reilly.
9. Phil Hanna, “JSP The Complete Reference”, Osborne/McGraw-Hill.
10. Steven Holzner, “Beginning Ruby on Rails”, Wiley Publishing.

Semester VI

IMCA6C01 RESEARCH METHODOLOGY

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6C01
Course Title	Research Methodology
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

The course aims at introducing them to the basic concepts used in research and to scientific social research methods and their approach. It includes discussions on sampling techniques, research designs and techniques of analysis.

Course Objectives

By the end of the course the students will be able to:

1) Develop understanding of the basic framework of research process.

2) Develop an understanding of various research designs and techniques.

3) Identify various sources of information for literature review and data collection.

4) Develop an understanding of the ethical dimensions of conducting applied research.

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA6C01.1	Students will be able to understand basic concepts of research and the framework of research
IMCA6C01.2	Students will be able to solve the research problem by analyzing the data analyze data.
IMCA6C01.3	Students will be able to define how the ethical dimensions of research will conduct.
IMCA6C01.4	Students will have the ability to create a problem statement from a real-life problem.
IMCA6C01.5	Students will be able to organize and conduct research in an appropriate manner and appreciate the components of scholarly writing.

Detailed Syllabus:

Topic	Session	References
Module I- Meaning of Research – Types of Research.Research process- Problem definition-Objectives of Research.Research design- Data collection –Data Analysis.Interpretation of ResultsValidation of Results.Formulation of a Research problem.	1-7	Research Methodology By R Panneerselvam - Prentice Hall International 2004 - Eleventh printing, 2013
Module II- Basic Statistical measures - Measures of central tendency – Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean,Measures of variation – Range, Mean Deviation, QuartileDeviation, and Standard Deviation.	8-14	Research Methodology By CR Kothari - New Age International publishers SecondRevised Edition, Reprint 2013.
Module III- Ethics of Research- Scientific Misconduct- Forms of Scientific Misconduct.Measurementparameters- Measurement of errors - Measurement uncertainty.Statistical test of hypothesis- Ttest, Z Test, F-test, Chi-square test.	15-22	Research Methodology By CR Kothari - New Age International publishers Second Revised Edition, Reprint 2013.
Module IV- Guidelines for writing research Papers - Guidelines for writing the abstract, introduction,methodology, results and discussion, conclusion sections of a manuscript. Impact factor-Validity,Merits, limitations.Other measurements of impact.h-index-advantages	23-30	Research Methodology By Francis C. Dane, Brooks/Cole Publishing Company, California.
Module V- Intellectual property rights (IPR)- forms of IPR- patents-copyrights-Trademarks.Introduction to Latex, Basic Latex Commands , Interpretation and Report Writing-Meaning of Interpretation.Significance of Report Writing , Different Steps in Writing Report, Layout of the Research Report,Types of Reports, Oral Presentation.Mechanics of Writing a Research Report Precautions for Writing Research Reports.	32-40	Research Methodology By Francis C. Dane, Brooks/Cole Publishing Company, California. Fundamentals of statistics: S.C.Gupta,6thRevised and enlarged edition-April 2004, Himalaya Publications

Recommended Books & Reading List

1) Research Methodology By R Panneerselvam - Prentice Hall International 2004 -

Eleventh printing, 2013.

2) 2. Research Methodology By CR Kothari - New Age International publishers Second

Revised Edition, Reprint 2013.

3) 3. Research Methodology By Francis C. Dane, Brooks/Cole Publishing Company,

California.

IMCA6C02 DATA COMMUNICATIONS

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6C02
Course Title	Data Communications
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Basic objective of this course is to develop an understanding of the various aspects of data communications. The course covers the principles of data communications, the fundamentals of signaling, basic transmission concepts, transmission media, multiplexing etc.Students need not have prior familiarity with data communication, in order for this course to be successful.

Course Objectives

By the end of this course students will be able :

1. To understand the basic concepts of data communications.
2. To understand the concept of digital signal transmission
3. To understand the multiplexing techniques
4. To understand the switching techniques

Course Outcomes

On successful completion of the course :

CO.No	Description
IMCA6C02.1	Students will be able to understand and explain Data Communications System and its
IMCA6C02.2	Students will be able to explain the process of data communication.
IMCA6C02.3	Students will be able to familiarize with the basic taxonomy and terminology of the data communication area.
IMCA6C02.4	Students will have the ability to select appropriate data communications solutions to business problems and needs.
IMCA6C02.5	Students will be able to summarize different application of data communications and multiplexing techniques.

Detailed Syllabus:

Topic	Session	References
Module I 1-7 **Introduction:** Simplified data communications model**. Data and Signals**: AnalogandDigitalPeriodicAnalogSignals,DigitalSignals.Transmission impairments- Attenuation, Delay distortion, Noise.**Transmission Media**: Guided Transmission Media -Twisted pair wires, Coaxial, Optical fiber. Wireless Transmission - Terrestrial microwave, satellite microwave, broad cast Radio, Infrared.		Behrouz A Forouzan- Data Communications and Networking, 4th Edition. McGraw Hill ,William Stallings -Data and Computer communications – Prentice Hall of India, 7th Edition.
Module II **Digital Transmission:** Digital-to-Digital Conversion- Line Coding- Characteristics of line coding.Line coding schemes- Unipolar encoding- NRZ, RZ, Manchester, Differential Manchester. Bipolar encoding: AMI., Block coding. Analog-to-Digital Conversion: Pulse Code Modulation (PCM)- Sampling, Sampling theorem, Nyquist rate, Pulse Amplitude Modulation (PAM)	8-15	Behrouz A Forouzan- Data Communications and Networking
Module III **Analog Transmission**: Digital-to-Analog Conversion – Bit Rate and Baud Rate, ASK, FSK, PSK, QAM. Analog-to-Analog Conversion- Amplitude Modulation, Frequency Modulation, and Phase Modulation **Multiplexing**: FDM, TDM, statistical TDM, WDM .**Channelization:** FDMA, TDMA, CDMA..	16-27	Behrouz A Forouzan- Data Communications and Networking
Module IV Transmission Mode: Parallel transmission, Serial transmission, Asynchronous transmission, synchronous transmission. Line Configurations, full duplex and half duplex transmission.Circuit switching: Telephone networks-local loops, trunks.Packet Switching: Datagram, virtual circuit. Effect of packet size on transmission time. Comparison of circuit switching and packet switching	28-35	Behrouz A Forouzan- Data Communications and Networking
Module V High-Speed Digital Access: DSL Technology-ADSL, xDSL, Spread Spectrum- Concept, Frequency Hopping, Direct Sequence.Cellular Telephony: Basic concepts, Frequency–Reuse Principle, Transmitting, Receiving, Handoff, Roaming. First Generation, Second Generation-GSM, Third Generation, Fourth Generation.	35-40	Behrouz A Forouzan- Data Communications and Networking

Recommended Books & Reading List

1. Behrouz A Forouzan- Data Communications and Networking, 4th Edition. McGraw Hill
2. William Stallings -Data and Computer communications – Prentice Hall of India, 7th Edition.
3. Andrews S. Tanenbaum -Computer Networks, Prentice Hall of India, 4th Edition.

IMCA6E02(a) ELECTIVE II -ANDROID PROGRAMMING

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6E02(a)
Course Title	Android Programming
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course is an attempt to provide you with the basic information about Android programming, general structure of the android app. This course teach about the android platform and application life cycle. Also enable students to write a simple android programming, use built in widgets and components, work with the databases to store data locally.

Course Objectives

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

1. Understand the purpose different development tools for Android
2. Design a graphical user interface
3. Integrate an applications with pre-existing third party libraries
4. Access location based services
5. Utilize Android Studio to create simple and complex applications
6. Plan, prepare and build an original Android from concept to working program.

Course Outcomes

On successful completion of this course :

CO.No	Course Outcome Description
IMCA6E02(a).1	Students will be able understand functionality and purpose of different android tools
IMCA6E02(a).2	Students will learn to design graphical user interface part.
IMCA6E02(a).3	Students will be able to make decision to solve a problem using package, library and threads.
IMCA6E02(a).4	Students will be able to apply the concepts to create small application in form of apps.
IMCA6E02(a).5	Students will be able to design and develop various kinds of apps.

Detailed Syllabus:

Topic	Session	References
Module I **INTRODUCTION** – Android, Android ecosystem, Android versions, Android activity, features of android, Android architecture, Android environment: operating system, java jdk, android SDK, Android development tools (ADT), Android virtual devices (AVD), Emulators, Dalvik virtual machine (DVM), Difference between JVM and DVM, Create the first android application.	1-8	John Horton, "Android programming for beginners"
Module II **Android user interface** – Linear layout, Absolute layout, Frame layout, Relative layout, Table layout, Designing your user interface with view – TextView, Button, ImageButton, EditText, CheckBox, ToggleButton, RadioButton and RadioGroup, ProgressBar, Autocomplete TextView, Spinner, ListView, GridView, ImageView, ScrollView, Custom Toast Alert, Time and Date Picker.	9-16	John Horton, "Android programming for beginners"
Module III **Real world layouts** – Building a real-world UI, Designing a form with relative layout, Android life cycle, life cycle phases. **Activity**: Introduction, Intent, Intent-filter, Activity life cycle, broadcast life cycle, Service. **Multimedia**: Android system architecture, Play audio and video, Text to speech.	17-24	John Horton, "Android programming for beginners"
Module IV **Animations** – Animations in android, Designing animations in XML, Instantiating animations and controlling them with java code, animation features, animation demo app. **Paging and Swiping:** Building an image gallery app. **Capturing images**: Capturing images from the camera, capturing images app.	25-28	John Horton, "Android programming for beginners"
Module V **SQLite –** Introduction, The android SQLite API, Creation and connection of the database, Extracting value from a cursor, Transactions. **Integrating Google Maps and GPS locations**: Introduction, GPS app, Google Maps app. **Publishing apps**: Preparing to publish, building the publishable apk file, publishing the app.	29-40	John Horton, "Android programming for beginners"

Recommended Books & Reading List

1. John Horton, "Android programming for beginners"
2. Prasanna Kumar Dixit, "Android", Vikas Publishing House.
3. Bill Phillips and Brian Hardy, "Android Programming, The Big Nerd Ranch Guide".
4. Kevin Grant and Chris Haseman, "Beginning Android Programming, Develop and Design.

IMCA6E02(b) ELECTIVE II REAL TIME OPERATING SYSTEM

Course overview

Program	IMCA
Semester	6
Course Code	IMCA6E02(b)
Course Title	Real Time Operating System
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course will help students to understand the concepts of Operating systems and also the basics of task management and task scheduling. It also helps to gain the knowledge on RTOS , Memory management, performance metrics and RTOS tools.

Course Objectives

By the end of this course students will be able :

1 To acquire knowledge about concepts related to OS such as Scheduling techniques, threads, inter-thread communications, memory management.
2 To acquire knowledge about different types of scheduling algorithms
3 To study about FreeRTOS
4 To understand the various functions of RTOS

Course Outcomes

On successful completion of the course:

CO.No	Course Objective Description
IMCA6E02(b).1	Students will be able to identify the need to create the special purpose operating system.
IMCA6E02(b).2	Students will be able to describe the fundamental concepts of RTOS
IMCA6E02(b).3	Students will be able to apply Scheduling techniques
IMCA6E02(b).4	Students will be able to develop programs for real time services, firmware and RTOS.
IMCA6E02(b).5	Students will be able to evaluate the requirement for task synchronization and coordination handled by operating system

Detailed Syllabus

Topic	Session	Reference
MODULE I Real-Time Concepts: Brief history of Real Time Systems, A brief history of Embedded Systems, Real time services, Real time standards, System resources, Resource Analysis, Real-Time Service Utility , Real time operating System.	1-8	Sam Siewert , “Real-Time Embedded Systems And Components”.
MODULE II Preemptive Fixed Priority Scheduling Policy, Rate Monotonic least upper bound, Necessary and Sufficient feasibility, Deadline – Monotonic Policy, Dynamic priority policies, Worst case execution time, Blocking , Deadlock and live lock. Critical Section to protect shared resource.	9- 16	Sam Siewert , “Real-Time Embedded Systems And Components”.
MODULE III Operating System basics, Types of operating system, Task, process and Threads, multi processing and multitasking, Task Scheduling, Task states, Idle Task, Task Communication, Task Synchronization.	19-26	Shibu K V, “Introduction to Embedded System ”
MODULE IV Embedded Firmware Design Approaches, Embedded Operating System based approach, Integrated development environment (IDE), Overview of IDEs for Embedded System Development. Introduction to FreeRTOS, multitasking on an LPC17xx Cortex-M3 Microcontroller, LPC17xx Port of FreeRTOS, Resources Used by FreeRTOS, Task Management, Task Functions, Task Priorities, Idle task and task hook function, Creation and Deletion of tasks.	27-32	Sam Siewert , “Real-Time Embedded Systems And Components”. Shibu K V, “Introduction to Embedded System”
MODULE V Queue Management, Characteristics of a Queue, Working with Large Data, Interrupt Management, Queues within an Interrupt Service Routine, Critical Sections and Suspending the Scheduler.	33-40	Sam Siewert , “Real-Time Embedded Systems And Components”. Shibu K V, “Introduction to Embedded System ”

Recommended Books and Reading List

1. Sam Siewert , “Real-Time Embedded Systems And Components”.
2. Shibu K V, “Introduction to Embedded System ”.
3. “Using the FreeRTOS Real Time Kernel” From FreeRTOS.
4. Manuals and Technical Documents from the ARM Inc, web site.

IMCA6E02(c) Elective II DISTRIBUTED PROCESSING

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6E02(c)
Course Title	Distributed Processing
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

The course 'Distributed Processing' helps students to understand as a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. The components interact with one another in order to achieve a common goal such as solving a large computational problem. The purpose of the distributed system is to coordinate the use of shared resources or provide communication services to the users.

Course Objectives

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

1. Understand about distributed systems and give explanation about what are its goals and types. It explains about the various architectures, middleware and its automatic adaptation. It gives an explanation about the importance of multithreading in distributed systems, Virtualization, Clients, Servers, Code Migration
2. Know about RPC, Naming, Synchronization, algorithms and mutual exclusion.
3. Know about consistency, fault tolerance and distributed file systems.
4. Know about cloud architecture and models, its services and solutions.
5. Understand virtualization, types and structures, clusters and resource management, cloud architecture, design challenges, security challenges and risks.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA6E02(c).1	List the basic concepts of distributed processing and their features.
IMCA6E02(c).2	Explain about the main ideas of distributed processing.
IMCA6E02(c).3	Apply the various techniques available in distributed processing.
IMCA6E02(c).4	Differentiate the sub features, explaining its role in distributed processing
IMCA6E02(c).5	Evaluate the various technologies available in distributed processing.

Detailed Syllabus:

Topic	Session	References
Module I Introduction to distributed systems – definition, types,goals,Architectures, System architectures, architectures versus middle ware,self-management,	1-10	A.S Tanenbaum and M.V Steen, "Distributed Systems – Principles and Paradigm", 2nd Edition, PHI Publications
Module II Processes, Threads, Virtualization Clients, Servers ,Code Migration, Communication–RPC, Message oriented ,Stream oriented.	11-20	A.S Tanenbaum and M.V Steen, "Distributed Systems – Principles and Paradigm", 2nd Edition, PHI Publications
Module III Naming – flat naming, structured naming, attribute-based naming,Synchronization–Clock synchronization,Logical Clocks.Election Algorithms, Mutual Exclusion	21-28	A.S Tanenbaum and M.V Steen, "Distributed Systems – Principles and Paradigm", 2nd Edition, PHI Publications
Module IV Consistency and replication – Data centric consistency, client centric consistency, consistency protocols. Fault Tolerance – introduction, process resilience. Reliable client-server communication. Reliable group communication. Distributed commit Recovery	29-36	A.S Tanenbaum and M.V Steen, "Distributed Systems – Principles and Paradigm", 2nd Edition, PHI Publications
Module V Security: Introduction to security, Secure channels, Access control,Security management	37-42	A.S Tanenbaum and M.V Steen, "Distributed Systems – Principles and Paradigm", 2nd Edition, PHI Publications

Recommended Books & Reading List

1. A.S Tanenbaum and M.V Steen, "Distributed Systems – Principles and Paradigm", 2nd Edition, PHI Publications
2. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design", 4th Edition, Pearson Education 2005.
3. M.L. Liu, "Distributed Computing Principles and Applications", Pearson Addison Wesley, 2004.
4. Mukesh Singhal, "Advanced Concepts in Operating Systems", McGraw Hill series in Computer science, 1994.
5. Nancy A. Lynch, "Distributed Algorithms", The Morgan Kaufmann Series in Data Management System, Morgan Kaufmann Publishers, 2000.

IMCA6E02(d) ELECTIVE II EMBEDDED SYSTEM DESIGN

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6E02(d)
Course Title	Embedded System Design
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course helps the students to be aware about the fundamental concepts of the embedded system. It also introduces the execution environment and the platforms used for the development of embedded systems. Various design methodologies and tools for both software and hardware components for distributed computing are also explained.

Course Objectives

By the end of this course students will be able :

1. To understand the basic concepts of embedded systems.
2. To acquire knowledge about the development environments of the systems.
3. To acquire knowledge about the various embedded computing platforms.
4. To be aware about the system design and techniques of embedded system.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA6E02(d).1	Students will be able to explain the fundamentals of embedded system design
IMCA6E02(d).2	Students will be able to analyze the development and execution environment of embedded systems
IMCA6E02(d).3	Students will be able to compare different design methodologies and tools applied to embedded systems
IMCA6E02(d).4	Students will be able to evaluate the requirements of programming Embedded Systems, related software architectures and tool chain for Embedded Systems.
IMCA6E02(d).5	Students will be able to evaluate the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.

Detailed Syllabus:

Topic	Session	References
Module I Introduction - Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Embedded computing – characteristics of embedded computing applications – embedded system design challenges – constraint-driven design – IP-based design – hardware and software co-design	1-10	Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers. Jean J.Labrosse, "Embedded system Building blocks: complete and ready-to-use modules in C".
Module II Development Environment - The Execution Environment - Memory Organization - System Space - Code Space - Data Space - Unpopulated Memory Space - I/O Space - System Start-up - Interrupt Response Cycle - Function Calls and Stack Frames - Run-Time Environment - Object Placement	11-20	Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers. Jean J.Labrosse, "Embedded system Building blocks: complete and ready-to-use modules in C".
Module III Embedded Computing Platform - CPU bus – memory devices – I/O devices – component interfacing – designing with microprocessors – development and debugging.	21-28	Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers. Jean J.Labrosse, "Embedded system Building blocks: complete and ready-to-use modules in C".
Module IV Distributed Embedded System Design - Inter-process communication: signals – signals in UML – shared memory communication – accelerated design – network-based design.	29-34	Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers. Jean J.Labrosse, "Embedded system Building blocks: complete and ready-to-use modules in C".
Module V Design Technique - Design methodologies and tools – designing hardware and software components - requirement analysis and specification – system analysis and architecture design.	35-40	Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers. Jean J.Labrosse, "Embedded system Building blocks: complete and ready-to-use modules in C".

Recommended Books & Reading List

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer Systems Design", Morgan Kaufman Publishers.
2. Jean J.Labrosse, "Embedded system Building blocks: complete and ready-to-use modules in C".
3. Arnold S. Berger, "Embedded Systems Design: An Introduction to Processes, Tools and Techniques"
4. Introduction to Embedded Systems , Shibu K.V, Mc Graw Hill
5. Embedded System Design .Frank Vahid, Tony Givargis, John Wiley

IMCA6S01 SEMINAR-I

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6S01
Course Title	Seminar
Type of Course	Core
Contact Hours	2 hours per week
Credit	2

Course Description

This course is intended to make IMCA students aware of the Current / Future trends related to Information Technology/ Computer Science/ Computer Application.

As such, a seminar report of not less than 15 pages is to be prepared and submitted for final evaluation.

The Seminar is to be evaluated internally by the College and carries a total Marks of 100 divided as follows:

1. Marks for relevance of topic (20)
2. Marks for literature study (20)
3. Marks for each Presentation (20)– 2 presentations (40)
4. Marks for Seminar Report (20).

The seminar report should be prepared as per the following guidelines:

1. No of pages: Not less than 15 pages.
2. Size A4, One sided.
3. Text Size 12; Title Size 14 Underlined; Line spacing: 1.5 Full Justified
4. Spiral Binding with uniformity in bind cover.

Every student is expected to present a minimum of 2 presentation of the seminar before the evaluation committee and for each presentation marks can be equally apportioned. A three-member committee consisting of qualified TEACHERS with PG in Computer Science / Computer Application from the MCA Department has to be appointed by Head of Department. The Committee duly appointed will evaluate the seminar. At the end of the semester the total marks have to be calculated and send to the University. A Student shall have to score 50 % for getting a pass in the Seminar.

IMCA6CP1 SOFTWARE DEVELOPMENT PROJECT -1

Course Overview

Program	IMCA
Semester	6
Course Code	IMCA6CP1
Course Title	Software Development Project-1
Type of Course	Core
Contact Hours	4 hours per week
Credit	6

Course Description

The [IMCA6CP1] project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research.

This course is one that involves practical work for understanding and solving problems in the field of computing. Any computer science project usually consists of the following: analysis, design, coding/implementation and testing of some information system or subsystem, such as, a piece of software. In this course we expect a software system or subsystem.

This course will also develop your investigative, research and report writing skills and will provide an opportunity for the candidate, to investigate a chosen topic in considerable depth.

This course provides the opportunity for students to demonstrate the application of their programming and research skills, and to apply their knowledge to complex computing problems.

Project Team

The project team should be organized and determined towards the fulfilment of their projects' objectives and tasks. A maximum of two students should work on a project, however, an individual student can also undertake the project on his/her own.

The main responsibilities of the project team/student are to:

- Ensure that an appropriate amount of time and effort is applied to the project,
- Ensure that they are responsive to the guidance of their counsellor,
- Acknowledge the text, material and ideas of others properly,
- Meet all milestones and regulations related to the work, and
- To communicate any problems that are likely to prejudice the quality or time lines of the work to the counsellor as and when problem arises.

Project Categories

Four broad areas / categories of computer science are given below, the candidate may select any of these category for Mini project.

- Application development
- Networking project
- System software
- Website development.

Semester VII

IMCA7C01 LINUX OS AND SHELL PROGRAMMING

Course Overview

Program	IMCA
Semester	7
Course Code	IMCA7C01
Course Title	Linux OS and Shell Programming
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

Linux operating system which belongs to the open source categoru is considered to be one of the most reliable, stable operating system and also the most used OS. The course intends to introduce OS concepts, basic Linux commands, shell scripts, user management, administration, networking and communications.

Course Objectives

By the end of the course the students will be able to:

1. To introduce Operating system concepts, file handling, filtering and editing.
2. Writing shell programs.
3. Understanding to Linux administration commands.
4. Carry out tasks related to system performance management, backup restore etc.
5. Use communication commands in Linux

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA7C01.1	Students will be able to recall the concepts of operating systems, Linux file handling commands,
IMCA7C01.2	Students will be able to describe management of Linux administration, concepts of users, groups and super user. Commands for carrying out various OS tasks.
IMCA7C01.3	Students will be able to write shell scripts to help make administration work simple and efficient. Students will be able to Install software, take backup and restore.
IMCA7C01.4	Students will be able to analyze performance monitoring of Linux installation.
IMCA7C01.5	Students will be able to install a Linux OS instance and configure it to meet the requirements.

Detailed Syllabus:

Topic	Session	References
Module I- Introduction to Linux - History, Architecture, Comparison with UNIX, Features and Facilities of Linux, Basic commands in Linux, Files and File Structure - Linux File System, Boot block, Super block, Inode table, Data blocks, Linux standard directories. File naming Conventions, Path, Types of file names and Users, File Commands in Linux, file comparisons, Directory Commands, Text Editors-Functions of a Text Editor, vi Editor, Locating Files, File Access Permissions [FAP], Viewing and Changing FAPs, Redirection, Filters, Pipes.	1-8	Operating System - Linux, NUT Press, PHI Publisher, 2006 Edition Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
Module II- Basics of shell programming, various types of shell available in Linux, comparisons between various shells, shell programming in bash - Conditional and looping statements, Iterations, Command Substitution - expr command, arithmetic expansion, parameter passing and arguments, Shell variables, system shell variables, shell keywords, Creating Shell programs for automating system tasks.	9-20	UNIX Shell Programming by Yeswant Kanetkar, BPB Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein -Pearson Education.
Module III- Common administrative tasks, identifying administrative files configuration and log files, Role of system administrator, Managing user accounts-adding &deleting users, changing permissions and ownerships, Creating and managing groups, modifying group attributes, Temporary disabling of users accounts, creating and mounting file system.	21-33	Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein -Pearson Education. Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
Module IV- Checking and monitoring system performance - file security & Permissions, becoming super user using su. Getting system information with uname, host name, disk partitions & sizes, users, kernel. Installing and removing packages. Backup, restore and Compress utilities - tar, cpio, dump,rsync and restore utilities	34-39	Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein -Pearson Education. Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
Module V- Communication in Linux - mesg, who- T, talk, write, wall, finger, chfn, ping, traceroute utilities, email facilities . Configuration of servers- Telnet, FTP, DHCP,NFS, SSH, Proxy Server(Squid), Web server (Apache), Samba. Daemons- init, crond, atd, xinetd, inetd, the services file. named, sshd, httpd.	34-40	Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India

Recommended Books & Reading List

1. Operating System - Linux, NUT Press, PHI Publisher, 2006 Edition
2. Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
3. UNIX Shell Programming by YeswantKanetkar, BPB
4. Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein -Pearson Education.
5. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India

Online References:

1. www.linuxmanpages.com
2. www.linuxcommand.org
3. www.reallylinux.com
4. www.linux.org
5. www.tuxfiles.org

IMCA7C02 ANALYSIS AND DESIGN OF ALGORITHMS

Course Overview

Program	IMCA
Semester	7
Course Code	IMCA7C02
Course Title	Analysis and Design of Algorithms
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course introduces concepts related to the design and analysis of algorithms. Specifically, it discusses recurrence relations, and illustrates their role in asymptotic and probabilistic analysis of algorithms. It covers in detail greedy strategies divide and conquer techniques, dynamic programming and backtracking. It also covers Lower bound theory and NP Hard problem.

Course Objectives

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

1. Demonstrate a familiarity with major algorithms and data structures.
2. Analyze the efficiency of algorithms using time and space complexity theory.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Introduce NP Hard and NP complete problems

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA7C02.1	Students will be able to define basic concepts in Analysis and Design of algorithm.
IMCA7C02.2	Students will be able to explain various algorithms and give examples for each category.
IMCA7C02.3	Students will be able to illustrate NP-Hard and NP-complete problems
IMCA7C02.4	Students will have the ability to compare the performance of different algorithms algorithm..
IMCA7C02.5	Students will be able to evaluate the efficiency of algorithms using time and space complexity theory.

Detailed Syllabus:

Topic	Session	References
Module I 1-6 Introduction – Algorithms - design strategies -concepts in performance analysis – space complexity, time complexity - asymptotic notation-practical complexities,Performance measurement.	1-6	Fundamentals of computer algorithms Ellis Horowitz, SartajSahni, Sanguthevar Rajeshekharan
Module II Divide and conquer method – General method, Finding the maximum and minimum, mergesort, Quick sort, Selection sort, Strassen's matrix multiplication.	7-16	Fundamentals of computer algorithms Ellis Horowitz, SartajSahni, Sanguthevar Rajeshekharan
Module III Greedy Method and Dynamic programming method –The general method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning tree -prim's algorithm and kruskal's algorithm, optimal storage on tapes. Dynamic programming Genera l method, multistage graphs, All pairs shortest paths, The traveling salesperson problem	17-24	Fundamentals of computer algorithms Ellis Horowitz, SartajSahni, Sanguthevar Rajeshekharan
Module IV Backtracking and branch and bound techniques –The general method, The 8 queens problem, Sum of subsets. Branch and Bound-least cost search, control abstraction for LC search	25-32	Fundamentals of computer algorithms Ellis Horowitz, SartajSahni, Sanguthevar Rajeshekharan
Module V Lower bound theory and NP Hard problem – Comparison trees-searching, sorting And selection. Concepts of NP hard and NP -complete problems, non deterministic algorithms, Classes of NP hard and NP complete. COOK'S theorem	34-40	Fundamentals of computer algorithms Ellis Horowitz, SartajSahni, Sanguthevar Rajeshekharan

Recommended Books & Reading List

1. Fundamentals of computer algorithms -Ellis Horowitz, SartajSahni, SanguthevarRajeshekharan (Galgotia)
2. Fundamentals of algorithms – Gilles Brassard, Paul Bratley (PHI)
3. Introduction to the design and analysis of algorithms AnanyLevitin (Pearson)
4. Computer algorithms –Introduction to design and analysis Sara Baase, Allen VanGelder (Pearson).

IMCA7C03 DATA MINING AND WAREHOUSING

Course Overview

Program	IMCA
Semester	7
Course Code	IMCA7C03
Course Title	Data Mining And Ware housing
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course is an attempt to provide you with the basic information about dataware house and their development. This course also provides the basic conceptual background necessary to design and develop data ware house applications. It gives an introduction to methods and theory for development of data warehouses and data analysis using data mining. Data quality and methods and techniques for preprocessing of data. Modeling and design of data warehouses. Algorithms for classification, clustering and association rule analysis.

Course Objectives

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

1. Understanding of the concepts of data warehousing and data mining.
2. Study the dimensional modeling technique for designing a data warehouse.
3. Study data warehouse architectures, OLAP and building a data warehouse.
4. Explain the knowledge discovery process .
5. Describe the data mining tasks and study their well-known techniques.

Course Outcomes

On successful completion of the course:

CO.No	Course Outcome Description
IMCA7C03.1	Students will be able to understand functionality of the various data mining and data warehousing.
IMCA7C03.2	Students will learn the strengths and limitations of various data mining and data warehousing models.
IMCA7C03.3	Students will be able to analyze different techniques of various data clustering .
IMCA7C03.4	Students will be able to compare different approaches of data ware housing and data mining with various technologies.
IMCA7C03.5	Students will be able to create research interest towards advances in Data Mining.

Detailed Syllabus:

Topic	Session	References
Module I **Introduction to Data mining & Date WarehouseWhat is Data mining**, Data mining – KDD, Data mining Functionalities , Integration of Data mining systems, Major issues of Data mining, Applications :web mining, Social media, **Data Warehouses**-Databases, Data warehouses, Data Mart, Databases vs. Data warehouses, Data ware houses vs. Data mart, OLTP OLAP, OLAP operations/functions, OLAP Multi-Dimensional Models- Data cubes, Star, Snow Flakes, Fact constellation	1-7	Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
Module II Data Preprocessing and RulesData Preprocessing- Data Cleaning, Data Integration and Transformation, Data Reduction, Data discretization and concept hierarchy generation.Association Rules Mining: Basic Concepts, Apriori Algorithm	8-15	Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
Module III Introduction to Classification and Prediction, Issues Regarding Classification and Prediction, Decision Tree Induction: Decision Tree induction, Attribute Selection Measures, Tree Pruning.Bayesian Classification: Bayes' theorem **Rule Based Algorithms**: Using If - Then rules of Classification, K- Nearest Neighbor Classifiers. **Prediction :** Linear Regression, NonlinearRegression	16-26	Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
Module IV **Clustering**What is Cluster Analysis, Requirements of Cluster Analysis, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Density–Based Method: DBSCAN,OPTICS. Partitioning Methods :k-Means and k-Medoids, Hierarchical Method : Agglomerative and Divisive Hierarchical Clustering, BIRCH,Grid Based Methods: STING: STatistical INformation Grid, Model based Methods-Expectation-Maximization, Conceptual Clustering	27-33	Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
Module V **Advanced Data Mining Techniques:** Introduction, Web Mining- Web Content Mining, Web Structure Mining, Web Usage Mining. Text Mining. Graph mining:- Apriori based approach for mining frequent sub graphs.Social Network Analysis: - characteristics of social networks.	34-40	Dunham M H, "Data Mining: Introductory and Advanced Topics", Pearson Education, New Delhi, 2003.

Recommended Books & Reading List

1. Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
2. Dunham M H, "Data Mining: Introductory and Advanced Topics", Pearson Education, New Delhi, 2003.
3. Data Mining – BPB Editorial Board, BPB Publications, First Edition, 2004
4. Data Warehousing, Data Mining, & OLAP – Alex Berson, Stephen Smith, TMHill,2004
5. Data Warehousing, Sinha, Thomson Learning

IMCA7C04 CRYPTOGRAPHY

Course overview

Program	IMCA
Semester	7
Course Code	IMCA7C04
Course Title	Cryptography
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course introduces basic concepts in cryptography and computer security, and discusses their theoretical foundations as well as their practical application. Diverse threats, attacks, and countermeasures should be addressed which include cryptosystems, cryptographic protocols, and secure systems / networks. It focuses on how cryptographic algorithms and protocols work and how to use them. Students who complete this course will be able to describe the basic cryptanalytic techniques and examples of practical security solutions are explored to understand how to design and evaluate modern security solutions.

Course Objectives

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

1. Identify and mitigate software security vulnerabilities in existing systems
2. Identify computer and network security threats, classify the threats and develop a security model to prevent, detect and recover from the attacks.
3. Perform Encryption and decryption of messages using block ciphers, sign and verify messages using well known signature generation and verification algorithms
4. Learn fundamental concepts of computer security and cryptography and utilize these techniques in computing systems.
5. Understand the applied methods for authentication, access control, intrusion detection and prevention.

Course Outcomes

On successful completion of the course:

CO.No	Course Objective Description
IMCA7C04.1	Students will be able to understand cryptography and blockchain concepts and application
IMCA7C04.2	Students will be able to know how to apply security principles to system design
IMCA7C04.3	
IMCA7C04.4	students will be able to know Various network security applications, Firewall, IDS, Malicious softwares
IMCA7C04.5	Students will be in a position to create real time application of the cryptography by consider the symmetric asymmetric method

Detailed Syllabus

Topic	Session	Reference
MODULE I **INTRODUCTION TO CRYPTOGRAPHY:** Security Attacks, Services and Mechanism, A Model for Network Security, Modular Arithmetic, Basic terminology in cryptography, Concept of block and stream ciphers, concepts of Symmetric and Asymmetric cryptography. **CLASSICAL CRYPTOSYSTEMS**: - Symmetric cipher model, substitution and transposition, one time pad, Steganography	1-8	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
MODULE II **MODERN SYMMETRIC ENCRYPTION ALGORITHMS:** Feistel cipher structure , Confusion and Diffusion concepts,Data Encryption Structure(DES)-strength of DES, Triple DES,Block cipher mode of operation AES- evaluation criteria of AES, IDEA, BLOWFISH, stream ciphers –RC4,RC5	8-15	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
MODULE III **INTRODUCTION TO NUMBER THEORY:** Prime Numbers, Fermat's and Euler's Theorems, The Chinese Remainder Theorem. **PUBLIC- KEY CRYPTOGRAPHY:** Principles of Public-Key Cryptosystems, RSA, Key Management,Diffie Hellman Key Exchange, ElGamal Algorithm,Elliptic Curve Cryptography	16-26	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
MODULE IV **KEY MANAGEMENT AND AUTHENICATION:** Key Distribution, Authentication Requirements,Authentication Functions-Message Encryption, Message Authentication Code, Hash Function,Security oh MAC and Hash Function , MD5,SHA-1,RIPEMD-160,HMAC.	27-33	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
MODULE V Digital Signature, Authentication protocols, Digital Signature Standard, Intruders, Intrusion Detection techniques.Malicious softwareApplication of cryptography- Digital cash, Cypto-currency.**Block Chain-** definition, Generic elements of a blockchain, How blockchain works, Benefits and limitations of blockchain	34-40	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.

Recommended Books and Reading List

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd Edition, Pearson Education, 2007.
2. Ali Bahrami, "Object Oriented Systems Development using the unified modeling language", 1stEdition, TMH, 2008
3. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", 1stEdition, Pearson Education, 2006.
4. Pascal Roques, "Modeling Software Systems Using UML2", 1stEdition, WILEY Dreamtech, 2007.
5. Atul Kahate, "Object Oriented Analysis & Design", 1stEdition, TMH, 2007.
6. Mark Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, TMH, 2005.
7. Craig Larman, "Appling UML and Patterns: An introduction to Object", Oriented Analysis and Design and Unified Process, 3rd Edition, Pearson Education, 2007.

IMCA7C05 COMPUTER NETWORKS

Course Overview

Program	IMCA
Semester	7
Course Code	IMCA7C05
Course Title	Computer Networks
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Basic objective of this course is to include learning about computer network organization and its implementation. Students are also introduced to theoretical understanding of computer networks.

Course Objectives

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

1. Understand the general principles of Computer Network.
2. Understand how computer networks are organized with the concept of layered approach.
3. Understand how packets in the Internet are delivered

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA7C05.1	Students will be able to understand and describe the layered protocol model
IMCA7C05.2	Students will be able to describe, analyse and evaluate various related technical, administrative and social aspects of specific computer network protocols from standards documents.
IMCA7C05.3	Students will be able to design, analyse, and evaluate networks and services for homes, data centres, IoT/IoE, LANs and WANs
IMCA7C05.4	Students will have the ability to specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols
IMCA7C05.5	Students will have a working knowledge of datagram and internet socket programming

Detailed Syllabus:

Topic	Session	References
Module I **Networking Concepts**: Simplified network model. **Classification of networks**: LAN, MAN, WAN and the Internet. **Protocols and protocol architecture**. The OSI ref. Model, TCP/ IP ref. model. Comparison of the OSI and TCP/IP ref. models. A critiques of the OSI model and protocols, A critique of the TCP/IP ref. model, Novel Netware. **Data Link Layer**: Need for data link control, Frame synchronization - flag fields, bit stuffing, **flow control** - stop and wait , sliding window protocol, error detection - parity check, CRC, **Error control** - Stop and wait ARQ, Go back-N ARQ, HDLC protocol, other data link protocols - LAPB, LAPD.	1-12	Andrew S Tanenbaum- Computer Networks - Fourth Edition- PHI William Stallings- Data and computer communications- PHI- Seventh Edition.
Module II **Local Area Networks: Topologies** - Bus, tree, ring and star .LAN protocol architecture (IEEE - 802 reference model)- Logic link control- Medium access control:-Random access- Aloha, CSMA, CSMA/CD, Exponential Back off algorithm ,CSMA/CA, controlled access-Reservation, Polling, Token Passing.**Physical Layer:** Implementation. **LAN Connecting Devices**-Repeaters, Hubs, Bridges:- filtering, Transparent Bridges, Spanning Tree Algorithm. Two-Layer Switch. **Backbone Networks**-Bus Backbone- Star Backbone, Connecting Remote LANs.	13-22	Behrouz A. Forouzan - Data Communications and Networking-Fourth Edition- Tata McGraw Hill William Stallings- Data and computer communications- PHI- Seventh Edition.
Module III **Wireless LAN Technology**:-Overview, Wireless LAN Requirements, Wireless LAN Technology. **Infrared LANs**- Strengths and Weakness, **Transmission Techniques**. Spread Spectrum LANs- Configuration, Transmission Issues. Narrowband Microwave LANs.**IEEE 802.11 Wireless LAN Standard:-** IEEE 802.11 Architecture and Services, Medium Access Control-CSMA/CA, Physical Layer-IEEE-802.11 FHSS, IEEE-802.11, DSSS,IEEE-802.11a OFDM, IEEE-802.11b HR-DSSS, IEEE-802.11g OFDM. IEEE- 802.11 Addressing Mechanism **Bluetooth:-** Architecture, Bluetooth Layers, Radio Layer, Baseband Layer, L2CAP, Other Upper Layers. **VIRTUAL LANS:-** VLAN Technology, Membership, Configuration, Communication Between Switches, IEEE Standard, Advantages	23-29	Andrew S Tanenbaum- Computer Networks - Fourth Edition- PHI Behrouz A. Forouzan - Data Communications and Networking-Fourth Edition- Tata McGraw Hill
Module IV **Network Layer**: Services of NW layer, Routing: Characteristics, performance criteria, **Routing strategies**: fixed routing- flooding-random routing- Adaptive routing, Congestion control, **Switched WAN** - Virtual Circuit Switching, Addressing, Virtual circuit identifier, Connection Setup:- Permanent Virtual Circuit, Switched Virtual Circuit.	30-33	Andrew S Tanenbaum- Computer Networks - Fourth Edition- PHI

Module V **Frame Relay**:- Back ground, Architecture, Frame Relay Layers, Frame Relay frame -LAPF core, LAPF control. **ATM** :- design goals, Cell Network, Asynchronous TDM, ATM Architecture, Identifiers, ATM Layers:- ATM layer, ATM Adaptation Layer:- AALI, AAL2, AAL3/4, AAL5. **Transport Layer**: Services, elements of transport protocol, simple transport protocol.	34-40	Behrouz A. Forouzan - Data Communications and Networking-Fourth Edition- Tata McGraw Hill Andrew S Tanenbaum- Computer Networks - Fourth Edition- PHI

Recommended Books & Reading List

1. Behrouz A. Forouzan - Data Communications and Networking-Fourth Edition- Tata McGraw Hill
2. William Stallings- Data and computer communications- PHI- Seventh Edition.
3. Andrew S Tanenbaum- Computer Networks - Fourth Edition- PHI.
4. William Stallings - Wireless Communications and Networks-Pearson Education.
5. William Stallings- ISDN and BROADBAND ISDN WITH FRAME RELAY AND
6. ATM-Fourth Edition – Pearson Education.
7. Gerd Keiser - Local Area Networks- Second Edition - Tata McGrawHill

IMCA7P06 PHP PROGRAMMING PRACTICALS

Course Overview

Program	IMCA
Semester	7
Course Code	IMCA7P06
Course Title	PHP Programming Practicals
Type of Course	Core
Contact Hours	4P+1T/P hour per week
Credit	2

Course Description

Basic objective of this course is to introduce the students to use PHP and MySQL to develop dynamic web sites for user on the Internet with MySQL database, building, connectivity, and maintenance.

Course Objectives

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

1. Understand the general concepts of PHP scripting language for the development of Internet websites.
2. Understand the basic functions of MySQL database program.
3. Learn the relationship between the client side and the server side scripts.
4. Develop a basic understanding about software development framework.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA7P06.1	Students will be able define the basic fundamentals of PHP
IMCA7P06.2	Students will be able to differentiate between client-side validation and server-side validation
IMCA7P06.3	Students will be able to apply Oops concepts in PHP
IMCA7P06.4	Students will be able to create database and establish connection using PHP
IMCA7P06.5	Students will be able to explain sessions and cookies used in PHP

Detailed Syllabus:

Topic	Session	References
Module1 **PHP**: Variables, echo / print, Strings, Operators , Control structures, Functions, Arrays, Super-global variables .Implementing **object-oriented programs using PHP**: Creating classes and accessing class members in different php pages, inheritance	1-8	The complete reference PHP, Holzner; 1st EditionMcGraw Hill Education,
Module II **PHP Forms**: Form handling, form validation, Cookies, Sessions. **File Handling in PHP, File Upload, Sending Email.**	9-16	The complete reference PHP, Holzner; 1st EditionMcGraw Hill Education, https://github.com/PHPMailer/PHPMailer
Module III **PHPMyAdmin**:db management in PHPmyadmin (create, drop, rename), table management (create, drop, rename, setting primary key, auto increment, default values, null),import data to the db (CSV/SQL), export data from db(CSV/SQL). **Connecting MySql from PHP:** mysqli_Connect, mysqli_querry(Insert, update, delete, limit data) ,mysql_close,	17-23	The complete reference PHP, Holzner; 1st EditionMcGraw Hill Education,
Module IV **JavaScript**- Variables, Functions, Event Handling, Form Validation using JavaScript. **AJAX**- submitting a section of a page using AJAX	21-30	The complete reference PHP, Holzner; 1st EditionMcGraw Hill Education,.
Module V **Introduction to PHP frameworks**- Introduction to MVC architecture, Laravel, Basic features, Creating projects using Laravel, Mini Project.	31-38	https://laravel.com/docs/7.x

Recommended Books & Reading List

Web Programming, Chris Bates, 3 rd Edition; Pub: John Wiley & Sons
The complete reference PHP, Holzner; 1st EditionMcGraw Hill Education,
https://github.com/PHPMailer/PHPMailer
Official Laravel Documentation https://laravel.com/docs/7.x
https://www.phptpoint.com/laravel-tutorial/
https://www.tutorialandexample.com/creating-first-laravel-project/
http://wifo5-03.informatik.uni-mannheim.de/bizer/rdfapi/tutorial/introductionToRAP.htm

Lab Record Programs

Demonstrate web page development using any text/HTML editors (Dreamweaver/ Eclipse/ Notepad++ etc). All students are supposed to prepare a lab record (written/printed) with minimum30 programs including the mini project.

1. Develop programs based on control structures, functions and arrays (8)
2. Develop programs based on classes and inheritance (using functions of classesdefined in the same file and in different file) (5)
3. Develop form-based PHP applications with server-side and client-side (JavaScript) validations. (5)
4. Develop programs based on session and cookie (2)

5. Develop programs to demonstrate file handling in PHP.
6. Develop program to upload file (with displaying uploaded file in web page)
7. Develop program to send E-Mail using PHP.
8. Develop programs based on database connectivity using PHP (5)
9. Program to implement AJAX in PHP application
10. Mini project using Laravel framework

IMCA7P07 LINUX OS AND SHELL PROGRAMMING PRACTICALS

Course Overview

Program	IMCA
Semester	7
Course Code	IMCA7P07
Course Title	Linux OS and Shell Programming Practicals
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

The Linux OS and shell programming practical, exposes the students to Installation of Linux, manage users and groups. Use essential commands, manage file permissions, commands related to managing system processes, create shell scripts, administration commands, manage processes and jobs, Install upgrade packages, carry out communication in Linux commands.

Course Objectives

By the end of the course the students will be able to:

1. Familiarize the user with concepts of operating systems
2. Learn basic and advance file handling commands, process management, users and group concepts.
3. Shell scripting
4. Administration, backup, restore and related commands.
5. Communication commands used commonly in Linux

Course Outcomes

On successful completion of this course :

CO.No	Course Outcome Description
IMCA7P07.1	Students will be able to understand Linux commands and shell script structure
IMCA7P07.2	Students will be able to describe organization and functioning. Purpose of administration, process management.
IMCA7P07.3	Students will be able to develop shell script, take backups, restoration configure a Linux installation.
IMCA7P07.4	Students will learn how Linux can be implemented effectively in comparison with other platforms.
IMCA7P07.5	Students will learn to create a networked environment using Linux platform.

Detailed Syllabus:

Topic	Session	Reference
MODULE I Basic Overview of various commands- cal, pwd, cd, ls, mv, cd, cp, rm, mkdir, rmdir, more, less, touch. Creating and viewing files using cat, file comparisons, disk related commands, checking disk free spaces. Batch commands, kill, ps, who, Printing commands, find, sort, touch, file, file processing commands- wc, cut, paste etc . mathematical commands - expr, factor etc.	1-6	Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
MODULE II Filter commands- pr, head, tail, cut, sort, uniq, tr. Filter using regular expression grep, egrep, sed, awk	7-12	Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
MODULE III Shell Programming -Shells, Scripting Rationale Creating a bash Script, bash Start up Files, A Script's Environment, Exporting Variables, Exit Status, Programming the Shell, Parameter Passing, Operators, looping, Input and Output.	13-24	LINUX Shell Programming by YeswantKanetkar, BPB Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
MODULE IV Process Management with Linux, File System management, User Administration, Linux Start up and Shutdown, Software package Management, Network Administration	25-32	Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein Pearson Education.
MODULE V Communication in Linux - mesg, who-T, talk, write, wall, finger, chfn, ping, traceroute utilities, email facilities . Configuration of servers- Telnet, FTP, DHCP,NFS, SSH, Proxy Server(Squid), Web server (Apache), Samba.	33-40	Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein Pearson Education. Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India

Recommended Books & Reading List

1. Red Hat Linux Bible, Cristopher Negus, Wiley Dreamtech India
2. LINUX Shell Programming by YeswantKanetkar, BPB
3. Linux Administration Handbook, EviNemeth,Garth Snyder, Trent KHein Pearson Education.

Online Resources

1. www.linuxmanpages.com
2. www.linuxcommand.org
3. www.reallylinux.com
4. www.linux.org
5. www.tuxfiles.org

Semester VIII

IMCA8C01 EMPLOYABILITY SKILLS

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8C01
Course Title	Employability Skills
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

This course enable students to identify their strengths and weaknesses.Measure each student's numerical ability, problem solving and mathematical skills.Enhance aptitude and reasoning ability of students that will make them capable of securing a job with any recruiter.Guide students in Resume making.

Course Objectives

By the end of the course the students will be able to:

1. Enhance aptitude and reasoning ability that will make them capable of securing a job with any recruiter.
2. Write a good Resume.
3. Develop ways to extend and improve interpersonal skills, negotiating skills, leadership skills, creativity and conflict management skills.

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA8C01.1	Students will be able to understand all aspects communication and its effect on giving and receiving information.
IMCA8C01.2	Students will be able to equip students to effectively tackle the interview process, leaving a positive impression with the prospective employer
IMCA8C01.3	Students will be able to articulate the importance of self-preparation.
IMCA8C01.4	Students will be able to help students enhance their Technical skills on interview basis.
IMCA8C01.5	Students will be able to solve Quantitative, Verbal and Logical Reasoning and Comprehension problems in IT recruitment drives and other competitive exams.

Detailed Syllabus:

Topic	Session	References
Module I- **Motivation And Goal Setting** Motivation, Assertiveness, Career Exploration and Life Planning, Goal Setting, Time Management, Stress Management. **Activity:** Must Read *(Institution option possible)* Karmayogi: A Biography of E. Sreedharan by M. S. Ashokan The 7 Habits of Highly Effective People – Stephen R. Covey The Leader Who Had No Title - Robin Sharma	1-2	Karmayogi: A Biography of E. Sreedharan by M. S. Ashokan The 7 Habits of Highly Effective People – Stephen R. Covey The Leader Who Had No Title - Robin Sharma
Module II- **Arithmetical And Verbal Reasoning Ability:** Problems on Numbers, Problems on Ages, Percentage, Ratio and Proportion, Time and Work, Time and Distance, Problems on Trains, Boats and Streams, Alligation or Mixture, Area, Average, Races and Games of Skill, Calendar, Clocks, Banker's Discount, Decimal Fractions, Heights and Distance, Odd Man Out and Series. Types of verbal reasoning, Analogy, Series Completion, Coding and Decoding, Blood Relation, Puzzle Tests, Direction Sense Test, Venn Diagrams, Logical Sequence of Words, Syllogism, Cause and Effect, Dice, Cube and Cuboid, Seating Arrangement. **Activity:** Company wise sample Questions, Mock Test on Each Topic. **Data Interpretation & Logical Reasoning** Tabulation, Bar Graphs, Pie Charts, Line Graphs. **Activity:** Company wise sample Questions, Mock Test on Each Topic.	3-18	Aggarwal, R. S., *Quantitative Aptitude for Competitive Examinations*, New Delhi, S. Chand and Company Pvt. Ltd.
Module III- **Interpersonal Communication And Leadership** Interpersonal Communication, Concept of Leadership, Types, Six Styles of Leadership, Qualities of Leadership, Functioning of Leadership - Goal Setting, Rising to Your Potential, Coordinating, Decision making, Interacting, Negotiating, Time Management, Change Management and Mentoring. Accountability, Public Speaking & Presentation Skills. **Activity: Team Game**	19-21	Bharathi, T., Hariprasad, M. ed., Prakasam, V., *Personality Development and Communicative English*, Hyderabad, Neelkamal Publications Pvt. Ltd.,.
Module IV- **Group Discussion** Nature, Characteristics of Successful GD, Group Discussion Strategies, Techniques for Individual Contribution, Group Interaction Strategies, Practice Case Studies. **Activity: Group wise GD Training** **Individual And Group Interview** Characteristics of Interviews, Pre-Interview Preparation Techniques, Projecting a Positive Image, Answering Strategies. Types of Questions, Frequently Asked HR Questions **Activity: Sample interview** **Topics Covering On Technical:** C Language, Operating Systems, Data Structures, C++, Microprocessors, DBMS, Networking, Java Basics, Core Java, Advanced Java, PHP, Python, SQL .	22-28	Bharathi, T., Hariprasad, M. ed., Prakasam, V., *Personality Development and Communicative English*, Hyderabad, Neelkamal Publications Pvt. Ltd.,. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata McGraw Hill Education Private Limited.
Module V- **Activity: Group wise GD Training** Mock GD Sessions incorporating all Students	29-40	Bharathi, T., Hariprasad, M. ed., Prakasam, V., *Personality Development and*

Activity: Mock Interview Individual & Group Interview Sessions		*Communicative English*, Hyderabad, Neelkamal Publications Pvt. Ltd.,. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata McGraw Hill Education Private Limited.

Recommended Books & Reading List

1. Bharathi, T., Hariprasad, M. ed., Prakasam, V., *Personality Development and Communicative English*, Hyderabad, Neelkamal Publications Pvt. Ltd.,.
2. Rizvi, Ashraf M., *Effective Technical Communication*, New Delhi, Tata McGraw Hill Education Private Limited.
3. Aggarwal, R. S., *Quantitative Aptitude for Competitive Examinations*, New Delhi, S. Chand and Company Pvt. Ltd.
4. Aggarwal, R. S., *Modern Approach to Verbal n Nonverbal Reasoning*, New Delhi, S. Chand and Company Pvt. Ltd.
5. https://www.indiabix.com/interview/
6. https://www.campusgate.co.in/
7. https://www.sawaal.com/technical-questions-and-answers.html
8. https://www.campusgate.co.in/
9. http://www.allindiaexams.in/reasoning/verbal-reasoning-questions-answers
10. https://www.sawaal.com/aptitude-reasoning-questions-and-answers.html
11. https://www.indiabix.com/logical-reasoning/questions-and-an swers/

Evaluation:

	Total Marks: 100
Attendance	10%
Assignments / Seminar	30%
Tests	60%

NOTE:

The course IMCA 801 has only sessional assessment, the Head of the Institution should ensure that the class average does not exceed 80%.

IMCA8C02 ARTIFICIAL INTELLIGENCE

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8C02
Course Title	Artificial Intelligence
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

The course Artificial Intelligence aims to provide basic knowledge in various fields of AI. The course explains the algorithms for problem representation and emphasis on the importance of Machine learning and Expert systems.

Course Objectives

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

1. Get insights into basic knowledge of Artificial Intelligence, AI application along with its importance.
2. Be familiar with problem representation in symbolic notation.
3. Understand algorithmic approach in machine learning and automation
4. Analyze the matching techniques for organizing and manipulating knowledge. Predict pattern based on Reasoning.
5. Acquire basic Knowledge in various fields of AI.

Course Outcomes

On successful completion of this course :

CO.No	Description
IMCA8C02.1	Students will be able to know about the AI techniques and application area and be aware of knowledge representations.
IMCA8C02.2	Students will be able to understand the basic theory of problem-solving paradigms
IMCA8C02.3	Students will be able to enumerate the Knowledge representation using Rule based Algorithms and Reasoning
IMCA8C02.4	Students will be able to create logical instructions using prepositional logic.
IMCA8C02.5	Students will be able to evaluate the possibility of AI applications like Natural language processing, Expert systems in various problem domains of the real world.

Detailed Syllabus:

Topic	Session	References
Module I AI Introduction and History: Defining AI, Acting Humanly (Turing Test Approach), Thinking Humanly(Cognitive Modeling Approach), Thinking Rationally (laws of thought approach), Acting Rationally(Rational Agent Approach); Foundations of Artificial Intelligence. History of AI. AI Problems, Assumptions, Techniques, Level of Model, and Criteria for success.Problems, Problem spaces and Search - Problem Definition, Production systems, Problem characteristics, Production system characteristics	1-9	Stuart Russel and Peter Norvig: Artificial Intelligence – A Modern Approach, 2nd Edition Pearson Education Elaine Rich and Kevin Knight: Artificial Intelligence, Tata McGraw Hill 2nd Ed. N.P. padhy.
Module II **Searching Problems:** Knowledge Organization and Management . Search and Control Strategies - Examples of search problem, Uniformed or Blind search, Informed search, Searching AND-OR graphs Matching Techniques -Structures used for matching	9-17	Introduction to Artificial intelligence and expert systems by Dan W. Patterson, Prentice Hall India
Module III Knowledge Representation Schemes: Formalized Symbolic Logics - Syntax and Semantics of Propositional and Predicate logic. Properties of WFFS, Inference rules, Resolution. Non- Deductive Inference Method. Inconsistencies and Uncertainties – Non- monotonic reasoning. Truth Maintenance system, Default reasoning and the closed world assumption. Structured Knowledge - Associative Networks.	18-27	Introduction to Artificial intelligence and expert systems by Dan W. Patterson, Prentice Hall India
Module IV Knowledge Acquisition: General Concepts in Knowledge Acquisition - Types of learning, Difficulty in Knowledge Acquisition. General learning model, Performance measures. Early work in Machine Learning – Perceptron, Genetic algorithms, Intelligent editors Analogical and Explanation Based Learning – Analogical Reasoning and learning, Examples, Explanation based learning,	28-36	Introduction to Artificial intelligence and expert systems by Dan W. Patterson, Prentice Hall India
Module V Natural Language Processing - Overview of Linguistics, Grammars and Languages, Basic Parsing Techniques, Semantic Analysis and Representation structures. Natural Language generation, Natural language systems. Experts system Architectures: Rule-based system, Non production system, Dealing with uncertainty.	37-42	Introduction to Artificial intelligence and expert systems by Dan W. Patterson, Prentice Hall India.

Recommended Books & Reading List

1. Stuart Russel and Peter Norvig: Artificial Intelligence – A Modern Approach, 2nd Edition Pearson Education
2. Elaine Rich and Kevin Knight: Artificial Intelligence, Tata McGraw Hill 2nd Ed. N.P. padhy
3. Introduction to Artificial intelligence and expert systems by Dan W. Patterson, Prentice
4. Hall India (All Modules)

IMCA8C03 INTERNET TECHNOLOGY AND APPLICATIONS

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8C03
Course Title	Internet Technology And Applications
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

This subject aims to introduce the basic concepts and essential knowledge of the applications and technology of the Internet and World Wide Web. It provides a conceptual framework to understand the operation of the Internet and to understand how computers connect and communicate with each other. This subject also helps to develop students' analytical ability in network technology.

Course Objectives

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

1. Provides necessary information in data communications and networking.
2. Focusing on internetworking with TCP/IP protocol suite.
3. Give an insight to Autonomous systems, DNs and Transport layer services in networking

Course Outcomes

On successful completion of this course :

CO.No	Course Outcome Description
IMCA8C03.1	Students will be able to recall the basic concepts and applications of the Internet and World Wide Web.
IMCA8C03.2	Students will be able to apply relevant Internet knowledge to enhance their understanding of other networking situations.
IMCA8C03.3	Students will be able to use current Internet Technology necessary for daily life application.
IMCA8C03.4	Students will be able to understand the concepts like Email architecture DNS server and Multimedia services.
IMCA8C03.5	Students will be able to compare various Network Protocols like TCP, UDP,FTP,HTTP.SMTP

Detailed Syllabus:

Topic	Session	References
Module I Introduction-protocols and standards,The OSI model,TCP/IP Protocol suite, Addressing,connecting devices, Switching methods,Internet Protocol(IP), IP addressing: Classful addressing, Classless addressing, Subnetting and Supernetting .	1-8	Behrouz A. Forouzan - TCP/IP Protocol Suite- Fourth Edition- Tata McGraw Hill
Module II Private Networks, Virtual Private Network, Types of VPN, Network Address Translation (NAT)., Other Network layer Protocols:, ARP- working, packet format, RARP-working, packet format ICMP- types of messages, message format, Error reporting, query, debugging tools, IGMP- Group management, IGMP messages, Message format, IGMP operation. Host Configuration Protocols: BOOTP, DHCP.	9-18	Behrouz A. Forouzan - TCP/IP Protocol Suite- Fourth Edition- Tata McGraw Hill.
Module III Autonomous Systems. Unicasting, Unicast Routing Protocols: Interior Gateway Routing Protocol- concepts of Distance vector routing, link state routing, path vector routing. RIP, RIP timers, OSPF, OSPF links. Exterior Gateway Routing Protocol– BGP, BGP session.Multicasting, Multicast applications, Multicast Routing Protocols: MOSPF, DVMRP.	19-26	Behrouz A. Forouzan - TCP/IP Protocol Suite- Fourth Edition- Tata McGraw Hill
Module IV Introduction to transport layer, Transport layer services,UDP-User datagram,Use of UDP,UDP operation,UDP services, and UDP applications. TCP- TCPservices, TCP Features, Segment,TCP connection,Flowcontrol, Error control,Congestion control, TCP timers. DNS-need for DNS, Name Space DNS messages,Types of records. TelnetConcepts. SSH-Components,SSH packet format	27-35	Behrouz A. Forouzan - TCP/IP Protocol Suite- Fourth Edition- Tata McGraw Hill
Module V FTP connection, communication, file transfer, anonymous FTP.TFTP-Messages, Connection, data transfer. WWW- Architecture, web documents. HTTP: - Transactions, Request messages, Response message, Headers Sequencing and scheduling activities. Electronic Mail: Architecture, User agent - Sending Mail, Receiving Mail. Multipurpose Internet Mail Extensions (MIME). Mail transfer agent: SMTP.	36-40	Steven Holzner, “Beginning Ruby on Rails”, Wiley Publishing.

Mail access protocols: POP and IMAP. Introduction to IPv6- IPv6 addressing, IPv6 protocols.		

Recommended Books & Reading List

1. Behrouz A. Forouzan - TCP/IP Protocol Suite- Fourth Edition- Tata McGraw Hill
2. Andrew S Tanenbaum- Computer Networks- PHI- Fourth Edition.
3. Behrouz A. Forouzan - Data Communications and Networking- Fourth Edition- Tata McGraw Hill 4. William Stallings- Data and computer communications- PHI- Seventh Edition.
4. Douglas E. Comer- Internetworking with TCP/IP- Volume I- PHI- Third Edition.
5. Comer, Douglas. The Internet Book: Everything you need to know about computer networking and how the Internet works, 4th Ed., 2007

IMCA8C04 COMPILER DESIGN

Course overview

Program	IMCA
Semester	8
Course Code	IMCA8C04
Course Title	Compiler Design
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

This course will teach students about fundamental concepts and techniques used for developing a simple language compiler. This will include the examination of intermediate code states, machine code optimization techniques and support for advanced language features. At the end of the course, students will understand different considerations and phases of compilation, the impact of language features upon the compilation process, and the practical fundamentals of how a compiler is implemented.

Course Objectives

By the end of this course students will be able:

1. To understand the theory and practice of compiler implementation.
2. To implement Lexical Analyzer using Lex tool
3. To learn finite state machines and lexical scanning.
4. To learn context free grammars, compiler parsing techniques, construction of parse trees, symbol tables
5. To implement intermediate machine representations and actual code generation

Course Outcomes

On successful completion of the course:

CO.No	Course Objective Description
IMCA8C04.1	Students will be able explain different phases and various techniques used for the implementation of a compiler
IMCA8C04.2	Students will be able to interpret a scanner, parser, and semantic analyser without the aid of automatic generators
IMCA8C04.3	Students will be able to differentiate the lexical, syntactic and semantic analysis into meaningful phases for a compiler to undertake language translation
IMCA8C04.4	Students will be able to design the structures and support required for compiling advanced language features.
IMCA8C04.5	Students will be able to evaluate various various techniques used for the implementation of a compiler

Detailed Syllabus

Topic	Session	Reference
MODULE I **Introduction:** Compilers and Translators, structure of compiler, pass structure of compiler, book keeping, compiler writing tools, bootstrapping of compiler.**Lexical Analysis:** Role of lexical analyzer, design of lexical analyzer.Transition Diagrams, specification of tokens, recognition of tokens.	1-9	Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley
MODULE II **Finite Automata:** regular expressions, finite automata, construction of NFA from regular expression, finite state machines NFA to DFA, minimizing DFA, language for specifying lexical analyzers (Analyzer Generator: LEX). **Syntactic specifications:** grammars, context free grammars, parse trees and representation, ambiguity, regular expressions vs. context free grammars, non-context free language constructs.	10- 18	Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley
MODULE III Basic Parsing Techniques: Parsers, shift -reduce parsing, handle pruning, stack implementation of shift-reduce parser. Operator precedence parsing, top-down parsing, left recursion, left-factoring, Bottom up parsing, predictive parsers.	19-26	Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley
MODULE IV **Automatic construction of efficient parsers:** LR parsers, canonical collection of LR (0) items, SLR parsing tables, canonical LR parsing table. Semantic Analysis, Symbol table management, Error handling: - sources and reporting.	27-32	Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley
MODULE V **Intermediate code generation:** -postfix notation, syntax tree, three-address code, basic blocks and flow graph, DAG representation of basic blocks. **Code optimization: -** The principal sources of optimization, optimization of basic blocks, loops in flow graphs, Peephole optimization. **Code Generations: -** Issues in the design of a code generator, simple code generator methods	33-38	Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley

Recommended Books and Reading List

1. Alfred V Aho , Jeffrey D. Ullman, "Principles of Compiler Design", Narosa
2. Aho, Ullman and Sethi, "Principles of Compiler Design", Addison Wesley
3. J. P. Trembley and P. G. Sorensen, "Theory and Practice of Compiler Writing", McGraw Hill.

IMCA8E03 (a)Elective III SOCIAL NETWORK ANALYSIS

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8E03(a)
Course Title	Social Network Analysis
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course introduces students to the basic concepts and analysis techniques in SNA. Students learn how to identify key individuals and groups in social systems, to detect and generate fundamental network structures, and to model growth and diffusion processes in networks. Students will be trained in interpreting the meaning of the aforementioned phenomena and suggesting potential courses of action to reinforce or change the observed trends. After this course, students will be able to design and execute network analysis projects including collecting data and considering ethical and legal implications, to perform systematic and informed analyses of network data for personal, commercial and scholarly use, and to critically review SNA projects conducted by others.

Course Objectives

By the end of the course, the students should be able to

1. To understand the components of the social network.
2. To model and visualize the social network.
3. To mine the users in the social network.
4. To understand the evolution of the social network.
5. To know the applications in real time systems.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA8E03(a).1	Understand how to apply node and group level social network measures.
IMCA8E03(a).2	Collect network data in different ways while adhering to legal standards and ethics standard.
IMCA8E03(a).3	Mine the behaviour of the users in the social network
IMCA8E03(a).4	Predict the possible next outcome of the social network
IMCA8E03(a).5	Plan and execute network analytical computations.

Detailed Syllabus:

Topic	Session	References
Module I INTRODUCTION Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Blogs and online communities – Web-based networks – Applications of Social Network Analysis.	1-8	Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
Module II Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language –Ontological representation of social individuals – Ontological representation of social relationships.	9-17	Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
Module III Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities	18-28	GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
Module IV Understanding and predicting human behaviour for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Attack spectrum and countermeasures.	29-36	GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
Module V Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations	37-42	GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.

Recommended Books & Reading List

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007. BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.
2. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.

3. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
4. John G. Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

IMCA8E03 (b)Elective III KNOWLEDGE MANAGEMENT AND BUSINESS INTELLIGENCE

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8E03(b)
Course Title	Knowledge Management and Business Intelligence
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This Business intelligence and knowledge management systems course will give you a better understanding of the information tools used to assist decision-makers. Business Intelligence is a set of theories and methodologies that handle large amounts of data and information to assist managers with decision-making. With this course, you will also learn the process known as decision-making including the three steps involved.

Course Objectives

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

1. Be familiar with Knowledge Management concepts
2. Define terminology commonly used in Business intelligence
3. Describe different Business Intelligence Techniques.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA8E03(b).1	Students will be able to understand about Knowledge management concepts
IMCA8E03(b).2	Students will become familiar with different Business intelligence techniques
IMCA8E03(b).3	Students will be able to justify the use of intelligence Techniques.
IMCA8E03(b).4	Students will be able to design Business Intelligence systems.
IMCA8E03(b).5	Students will be able to analyze the different uses of knowledge management systems.

Detailed Syllabus:

Topic	Session	References
Module I Basics - What is Knowledge Management? - Key Challenges - KM Life Cycle - Understanding Knowledge – Definitions. Cognition and Knowledge Management - Data, Information, and Knowledge - Types of Knowledge - Expert Knowledge	1-5	Elias M. Awad, Hassan M.Ghaziri,"Knowledge Management", Pearson Education, 2004
Module II Knowledge Management System Life Cycle - Challenges in Building KM Systems - Conventional Versus KM System Life Cycle.KM System Life Cycle - System Justification - Role of Rapid Prototyping - Role of Knowledge Developer – User Training	6-12	Elias M. Awad, Hassan M.Ghaziri,"Knowledge Management", Pearson Education, 2004
Module III Knowledge Creation - Nonaka's Model of Knowledge Creation and Transformation - Knowledge Architecture - Capturing Tacit Knowledge – Evaluating the Expert – Developing a relationship with Expert – Interview as a tool – Brainstorming – Repertory Grid,Nominal Group Techniques(NGT) – Delphi method – Concept mapping Knowledge Codification - Codification Tools and Procedures - Knowledge Developers Skill Set - Knowledge Transfer - Transfer Methods - Portals Basics - Business Challenge - Knowledge Portal Technologies - Ethical and Legal Issues - Knowledge Owners - Legal Issues.	13-22	Elias M. Awad, Hassan M.Ghaziri,"Knowledge Management", Pearson Education, 2004
Module IV Changing Business Environments and Computerized Decision Support - A Framework for Business Intelligence - Intelligence Creation and Use and BI Governance Transaction Processing versus Analytic Processing - Successful BI Implementation - Major Tools and Techniques of Business Intelligence	23-27	Efraim Turban, Ramesh Sharda, Dursun Delen and David King, "Business Intelligence" 2 nd Edition, 2010.
Module V Implementing BI: An Overview - BI and Integration Implementation - Connecting BI Systems to Databases and Other Enterprise Systems - On-Demand BI - Issues of Legality, Privacy, and Ethics - Emerging Topics in BI: An Overview .The Web 2.0 Revolution - Online Social Networking: Basics and Examples - Virtual Worlds - Social Networks and BI: Collaborative Decision Making - RFID and New BI Application Opportunities - Reality Mining.	28-38	Efraim Turban, Ramesh Sharda, Dursun Delen and David King, "Business Intelligence" 2 nd Edition, 2010.

Recommended Books & Reading List

1. Elias M. Awad, Hassan M.Ghaziri,"Knowledge Management", Pearson Education, 2004, (For Units I, II and III).
2. Efraim Turban, Ramesh Sharda, Dursun Delen and David King, "Business Intelligence" 2 nd Edition, 2010. (For Unit IV – Chapter 1, Unit – V -Chapter 6)03

IMCA8E03 (c)Elective III FOUNDATION OF CLOUD COMPUTING

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8E03(c)
Course Title	Foundation of Cloud Computing
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course provides a comprehensive study of basic cloud computing concepts and cloud related technologies. It includes cloud models and services, cloud architecture and virtualization concepts. The course also covers the cloud security model and associated challenges and latest trends and technologies used in the cloud.

Course Objectives

By the end of the course the student will be able to

1. To develop an understanding of the fundamental concepts of cloud computing, including different cloud service models and deployment models.
2. To understand cloud architecture and importance of virtualization.
3. Be familiar with data storage in cloud and different cloud computing services.
4. To understand the importance of security in cloud computing and different cloud computing tools.
5. To gain knowledge about the cloud platforms used in industry, clouds computing applications future directions and trends.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA8E03(c).1	Students will be able to understand and recall the fundamental concepts of cloud computing.
IMCA8E03(c).2	Students will be able to describe the various cloud related concepts and technologies.
IMCA8E03(c).3	Students will be able to explore the vast ecosystem of the cloud and discover the importance of cloud related technologies
IMCA8E03(c).4	Students will have the ability to arrange appropriate tools and applications to suit their requirements.
IMCA8E03(c).5	Students will be able to compare the different cloud technologies, applications, and tools

Detailed Syllabus:

Topic	Session	References
Module I **Cloud Computing Fundamentals:** Introduction to Cloud Computing – History , importance and characteristics of Cloud computing. Move to Cloud Computing – migrating in to the cloud, seven step model. Types of Cloud – Public and Private Cloud, Cloud Infrastructure, Cloud Application Architecture. Working of Cloud Computing- Trends in Computing, Cloud Service Models, Cloud Deployment Models , Pros and Cons of Cloud Computing, Cloud Computing and Services: Pros and Cons	1-7	Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014
Module II **Cloud Computing Architecture and Virtualization:**Cloud Architecture –Cloud System Architecture, Cloud Development Model. Cloud Modelling and Design Virtualisation- types of virtualisation, benefits, and pitfalls of virtualisation, Virtualisation in Grid and Cloud, CPU virtualisation, network and storage virtualisation	8-15	Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014
Module III **Data Storage and Cloud Computing services:**Data Storage - Data Storage Management, File Systems, Cloud Data Stores, Using Grids for Data Storage. Cloud Storage – Data Management for Cloud Storage, Data intensive Technologies for Cloud Computing- Cloud Storage from LANs to WANs. Distributed Data Storage, Applications utilizing Cloud Storage.Cloud Services – software as a service, platform as a Service, infrastructure as a service, other cloud services.	16-24	Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014
Module IV **Cloud Computing Security and tools:** Risks in Cloud Computing – Data Security in Cloud – Cloud Security Services . Cloud Computing Tools- Tools and Technologies for Cloud,Cloud Mashups, Apache Hadoop,Cloud Tools- VMWare, Eucalyptus, CloudSim, OpenNebula, Nimbus.	25-33	Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014
Module V **Cloud Applications and Future Cloud :** Microsoft Cloud Services , Google Cloud Applications , Amazon Cloud Services, Cloud Applications. Future Cloud- Mobile cloud, Autonomic cloud engine, Multimedia Cloud. Energy aware Cloud computing, Jungle Computing.	34-40	Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014

Recommended Books & Reading List

1. Cloud Computing – A Practical Approach for Learning and Implementation, A.Srinivasan and J.Suresh, Pearson India Publications, 2014
2. “Cloud Computing – insights into New-Era Infrastructure”, Kumar Saurabh, Wiley India,2011.
3. “Cloud Computing: Implementation, Management, and Security” John W.Rittinghouse and James F.Ransome, , CRC Press, 2010.

4. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
5. *Cloud Computing: Principles and Paradigms,* Editors: Rajkumar Buyya, James Broberg, *Andrzej M. Goscinski, Wile, 2011*
6. *"Distributed and Cloud Computing, From Parallel Processing to the Internet of Things",Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Morgan Kaufmann Publishers, 2012.*
7. *"Cloud Computing, A Practical Approach" Toby Velte, Anthony Velte, Robert Elsenpeter, TMH, 2009.*

IMCA8E03(d) Elective III COMPUTER GRAPHICS

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8E03(d)
Course Title	Computer Graphics
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

Computer graphics are an intrinsic component of many modern software applications and are often essential to the success of these applications. Course provides the basic principles and techniques for computer graphics on modern graphics hardware. Students will gain experience in interactive computer graphics using C language. The principles and practice of computer graphics are described from their mathematical foundations to the modern applications domains of scientific visualization, and animation.

Course Objectives

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

1. This course will introduce students to all aspects of computer graphics including hardware, software and applications.
2. This course will familiarize students with fundamental algorithms and data structures that are used in today's interactive graphics systems.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA8E03(d).1	Students will be able to define the fundamental concepts of computers graphics
IMCA8E03(d).2	Students will be able to understand the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them..
IMCA8E03(d).3	Students will be able to apply computer graphics concepts in various applications
IMCA8E03(d).4	Students will be able to analyze the fundamentals of computer graphics including animation, underlying technologies, principles, and applications
IMCA8E03(d).5	Students will be able to evaluate and compare the 2D and 3D concepts while applying to various applications

Detailed Syllabus:

Topic	Session	References
Module I Introduction: A survey of Computer Graphics, overview of graphics systems-Video display devices-Refresh CRT.Raster-Scan and Random-Scan Displays, Color CRT Monitors, DVST, FlatPanel Displays.Raster Scan systems, Random scan systems, Input devices, Hard copy devices, Graphics software.	1-8	Computer Graphics C Version -Donald D.Hearn & M. Pauline Baker
Module II Output primitives: Line drawing algorithms: DDA algorithm, Bresenham's line algorithm, Circle generating algorithm-Midpoint circle algorithm.2D geometric Transformations: Basic transformations: Translation, Rotation, Scaling; Other transformations-Reflection and shear, Matrix representation and homogenous coordinates, Composite transformation.	9-16	Computer Graphics C Version -Donald D.Hearn & M. Pauline Baker
Module III Two-dimensional viewing: viewing pipeline, window to viewport transformation.Clipping operations- Point clipping, Line clipping: Cohen Sutherland line clipping, Text Clipping. Interactive Input Devices, Interactive Picture Construction Techniques.	17-24	Computer Graphics C Version -Donald D.Hearn & M. Pauline Baker
Module IV Three-dimensional concepts: Three dimensional display methods.Three dimensional object representations- Polygon surfaces, Sweep representations, octrees and quadtrees. 3D viewing- Parallel, Perspective projections.	25-32	Computer Graphics C Version -Donald D.Hearn & M. Pauline Baker
Module V Visible surface detection methods, Color Models – RGB,YIQ, CMY, HSV.Animation: Design of animation sequences, key-frame systems- morphing.	33-40	Computer Graphics C Version -Donald D.Hearn & M. Pauline Baker

Recommended Books & Reading List

1. Donald D.Hearn & M. Pauline Baker, Computer Graphics C Version, Second Edition,, PHI Pvt. Ltd.
2. Newman W M & R F Sproul, Principles of Interactive Computer Graphics, Second Edition Mc- Graw Hill Publishers
3. Plastock R & Xiang Z, Theory and problems of computer Graphics, Second Edition Schaum Series, McGraw Hill Publishers.

IMCA8P05 COMPILER DESIGN PRACTICALS

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8P05
Course Title	Compiler Design Practicals
Type of Course	Core
Contact Hours	4 hour per week
Credit	2

Course Description

This course will enlighten the student with knowledge base in compiler design and its applications. Students can demonstrate a working understanding of the process of lexical analysis, parsing and other compiler design aspects.

Course Objectives

By the end of this course Students will be able to :

1. Deepen the understanding of compiler design.
2. Develop problem solving ability using programming .
3. Develop ability to design and analyze a compiler.

Course Outcomes

On successful completion of the course:

CO.No	Course Objective Description
IMCA8P05.1	Students will be able to describe and simulate various lexical analyzers and parsers
IMCA8P05.2	Students will be able to apply different compiler writing tools to implement the different Phases
IMCA8P05.3	Students will be able to analyze the data flow and control flow
IMCA8P05.4	Students will be able to construct the intermediate Code representation
IMCA8P05.5	Students will be able to learn the implementation of the LEX and YACC tools

Detailed Syllabus:

Topic	Session
Programs to test whether a string is valid identifier, constant, comment etc.	1-6
Simulate lexical analyzer for identifiers, relational operators, if statement, arithmetic expression	7-15
Programs to recognize strings under 'a', 'a*b+', 'abb'.	16-20
Program to check whether a string belongs to the grammar or not	21-22
Write a program to generate a parse tree.	23-24
Program to find leading, trailing terminals.	25-28
Program to compute FIRST and FOLLOW of non-terminals.	29-31
Program to check whether a grammar is left recursive and remove left recursion.	32-34
Program to check whether a grammar is Operator precedent.	35-36
Practice with “LEX” and “YACC” tools of Compiler writing.	37-40

Recommended Books & Reading List

1. Allen I Holub ,Compiler design in C,Prentice Hall of India ,2003.
2. Vinu V .Das,Compiler design using FLEX and YACC,Prentice Hall of India ,2008

IMCA8CP2 MINI PROJECT -APPLICATION DEVELOPMENT

Course Overview

Program	IMCA
Semester	8
Course Code	IMCA8CP2
Course Title	Mini Project -Application Development
Type of Course	Core
Contact Hours	4 hours per week
Credit	2

Course Description

The mini project is designed to help students develop practical ability and knowledge about practical tools/techniques in order to solve real life problems related to the industry, academic institutions and computer science research.

Course Objectives

Students will be able to

1. Have practical experience for understanding and solving problems in the field of computing.

Course Outcomes

On successful completion of the course :

CO.No	Course Outcome Description
IMCA8CP2.1	Students will be able to understand and solve problems in the field of computing.
IMCA8CP2.2	Students will be able to investigative, research and improve report writing skills.
IMCA8CP2.3	Students will be able to to investigate a chosen topic in considerable depth.
IMCA8CP2.4	Students have the ability to demonstrate the application of their programming and research skills.
IMCA8CP2.5	Students will be able to apply their knowledge to complex computing problems.

Detailed Syllabus:

The course Mini Project involves practical work for understanding and solving problems in the field of computing. Any computer science project usually consists of the following: **analysis, design,**

coding/implementation and testing of some information system or subsystem, such as, a piece of software. In this course we expect a software system or subsystem.

This course will also develop to investigative, research and improve report writing skills and will provide an opportunity for students, to investigate a chosen topic in considerable depth. Mini Project provides the opportunity for students to demonstrate the application of their programming and research skills, and to apply their knowledge to complex computing problems.

Project Team

The project team should be organized and determined towards the fulfilment of their projects' objectives and tasks. A maximum of two students should work on a project, however, an individual student can also undertake the project on his/her own.

The main responsibilities of the project team/student are to:

- Ensure that an appropriate amount of time and effort is applied to the project,
- Ensure that they are responsive to the guidance of their counsellor,
- Acknowledge the text, material and ideas of others properly,
- Meet all milestones and regulations related to the work.
- To communicate any problems that are likely to prejudice the quality or time lines of the work to the counsellor as and when such problems arise.

Project Categories

Four broad areas / categories of computer science are given below, so that you can select any of these category for your Mini project.

- Application development
- Networking project
- System software
- Website development.

Semester IX

IMCA9C01 COMPUTATIONAL SUSTAINABILITY

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9C01
Course Title	Computational Sustainability
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

To have an increased awareness among students on issues in areas of sustainability. To understand the role of technology within sustainable development. And also to know the methods, tools and incentives for sustainable product-service system development. This course helps students to establish a clear understanding of the role and impact of various aspects of technological decisions on environmental, societal and economic problems

Course Objectives

By the end of the course the students will be able to

1. To have an increased awareness among students on issues in areas of sustainability
2. To understand the role of technology within sustainable development.
3. To know the methods, tools and incentives for sustainable product-service system development
4. To establish a clear understanding of the role and impact of various aspects of technological decisions on environmental, societal and economic problems.

Course Outcomes

On successful completion of the course :

CO.No	Description
IMCA9C01.1	Students will be able to understand the different types of environmental pollution problems and their sustainable solutions.
IMCA9C01.2	Students will have a broader perspective in thinking for sustainable practices by utilizing the knowledge and principles gained from this course
IMCA9C01.3	Students will be able to work in the area of sustainability for research and education
IMCA9C01.4	Students will be able to create a sustainable environment by implementing the sustainable practices they learned.
IMCA9C01.5	Students will be able to identify sustainability problems and find solutions

Detailed Syllabus:

Topic	Session	References
Module I- Sustainability: Introduction, Need and Concept of Sustainability Science; Social, Environmental and Economic Sustainability Concepts; Goals of Sustainability; Challenges for Sustainable Development;Nexus between Technology and Sustainable development;] Multilateral Environmental Agreements and Protocols; Clean Development Mechanism (CDM); Environmental legislations in India - Water Act, Air Act	1-5	Dr. Swarnalatha K, Dr. Binu Sara Mathew, "Sustainable Engineering", Orbit Publishers and Distributors, August, 2015. Shibu Krishnan, "Introduction to Sustainable Engineering", PKC Books, First Edition, 2015.
Module II- Environmental Issues : Air Pollutions – Sources and Types; Effects of Air Pollution; Control measures to reduce air pollution; Water pollution – Sources, Water Pollutants and its effects; Sustainable wastewater treatment; Solid waste – Sources, Impacts of solid waste; Zero Waste Concept; 3 R Concept of Waste Management . Global environmental issues- Resource Degradation, Climate Change, Global Warming, Ozone Layer Depletion; Regional and Local Environmental Issues; Carbon Credits and Carbon Trading; Carbon foot print.	6-12	Shibu Krishnan, "Introduction to Sustainable Engineering", PKC Books, First Edition, 2015.
Module III- Environmental Management Tools: Environmental Management System and Standards; ISO 14000 series; Life Cycle Analysis (LCA) – Goal and Scope.Biomimicking; Environment Impact Assessment (EIA) - Procedures of EIA in India.	13-23	Shibu Krishnan, "Introduction to Sustainable Engineering", PKC Books, First Edition, 2015.
Module IV- Sustainable Engineering: Basic Concepts of sustainable habitat; Green Buildings, Green Materials for building construction, Material Selection for Sustainable design;Green Building Certification; Methods for increasing energy efficiency of buildings; Sustainable Cities; Sustainable Transport; Sustainable Pavements	24-28	David T. Allen, David R. Shonnard, "Sustainable Engineering – Concepts, Design and Case Studies", Pearson Education, Prentice Hall, First Edition, 2012. Shibu Krishnan, "Introduction to Sustainable Engineering", PKC Books, First Edition, 2015.
Module V- Energy sources: Basic Concepts; Conventional and Non-Conventional sources of energy - Solar energy, Fuel cells, Wind energy, Hydro- electric power - Small hydro plants, Biofuels, Energy derived from oceans, Geothermal energy; Energy Conservation.	29-40	David T. Allen, David R. Shonnard, "Sustainable Engineering – Concepts, Design and Case Studies", Pearson Education, Prentice Hall, First Edition, 2012. Shibu Krishnan, "Introduction to Sustainable Engineering", PKC Books, First Edition, 2015.

Recommended Books & Reading List

1. David T. Allen, David R. Shonnard, "Sustainable Engineering – Concepts, Design and Case Studies", Pearson Education, Prentice Hall, First Edition, 2012.
2. Dr. Swarnalatha K, Dr. Binu Sara Mathew, "Sustainable Engineering", Orbit Publishers and Distributors, August, 2015.
3. Shibu Krishnan, "Introduction to Sustainable Engineering", PKC Books, First Edition, 2015.

IMCA9C02 NETWORK SECURITY WITH IPR

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9C02
Course Title	Network Security with IPR
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

Network security, which assumes you have a substantial knowledge of computing, helps to explain the intricacies of the continually changing area of network security by studying the main issues involved in achieving a reasonable degree of resilience against attacks. This course discusses different types of malicious attacks and various methods of responding to them. Students learn how to protect computer networks by using security codes. The course also examines malware, web security, privacy and e-mail Security.

Course Objectives

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

1. Identify some of the factors driving the need for network security
2. Identify and classify particular examples of attacks
3. Define the terms vulnerability, threat and attack
4. Identify the security in web and email
5. Learn more about the Intrusion and Malicious software in the network
6. Identity different Laws and regulation in networks

Course Outcomes

On successful completion of the course :

CO.No	Description
IMCA9C02.1	Students can understand the IP security
IMCA9C02.2	Students can know how to secure the email
IMCA9C02.3	Students can identify and investigate different Malicious software in networks
IMCA9C02.4	Students can create real time application of the web Security and Email
IMCA9C02.5	Students will be able to evaluate malware, web security, privacy and e-mail Security.

Detailed Syllabus:

Topic	Session	References
Module I 1-7 Network Concepts, Threats in Networks, Network Security Controls. Firewalls – Types, Comparison of Firewall Types, Firewall Configurations.	1-7	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
Module II Intruders: Intrusion detection, Host-Based Intrusion Detection, Distributed Host-Based Intrusion Detection,Network-Based Intrusion Detection, Intrusion Detection exchange. Malicious software: Virus, Virus Counter.	8-15	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
Module III IP Security: Overview of IP Security (IPsec), IP Security Architecture,Modes of Operation, Security Associations (SA),Authentication Header (AH), Encapsulating Security Payload (ESP),Internet Key Exchange. .	16-25	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
Module IV E-Mail security: S/MIME and Pretty Good Privacy(PGP).Web Security: Web Security Requirements, Secure Socket Layer (SSL),Transport Layer Security (TLS), Secure Electronic Transaction (SET). Digital Watermarking.	26-32	William Stallings, "Cryptography and Network security Principles and Practices", Pearson/PHI.
Module V 33-40 Intellectual Property: Types of Intellectual Property, Intellectual Property Relevant to Networks, Digital Millennium Copyright Act, Digital Rights Management(DRM), Privacy: Laws and Regulation, Computer Usage Privacy. Privacy and Data Surveillance, Ethics and IS Professionals, code of conduct		"Computer Security , Principle and Practice" by William Stallings and Lawrie brown, Pearson

Recommended Books & Reading List

1. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", Pearson.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.
3. Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall

IMCA9C03 DATA SCIENCE

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9C03
Course Title	Data Science
Type of Course	Core
Contact Hours	4T+1T/P hours per week
Credit	4

Course Description

The course Data Science provides insights into various disciplines like Statistics, Data Analysis, Data Mining, Machine learning. Course explains about various techniques and methods to extract knowledge. Further it discuss about the applications of Data science.

Course Objectives

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

1. Get insights into basic statistical concepts required for analysis.
2. To make the students aware of Probability distributions and its application.
3. Acquire knowledge about data mining techniques
4. Develop the analytical skills in applying machine learning algorithms.
5. Analyse the possibility of applying the techniques of data science.

Course Outcomes

On successful completion of the course :

CO.No	Course Outcome Description
IMCA9C03.1	Students will be able to know about the basic statistical concepts applied for data science.
IMCA9C03.2	Students will be able to understand the importance and application of various Probability distribution.
IMCA9C03.3	Students will be able to apply the appropriate data mining techniques for knowledge acquisition.
IMCA9C03.4	Students will be able to practically implement the machine learning algorithms.
IMCA9C03.5	Students will be able to judge the effectiveness of data science techniques in real time application.

Detailed Syllabus:

Topic	Session	References
Module-1: Introduction : Introduction to Data science: Big Data, Statistics, Machine Learning, Data Mining.BIG DATA: What is big data, why big data, convergence of key trends, unstructured data. Web analytics ,Industry examples of big data: big data and marketing , fraud and big data , risk and big data , credit risk management Types of Statistics: Inferential, Descriptive, Prescriptive, Predictive Application and importance of Correlation.	1-9	Getting Started With Data Science: Making Sense Of Data With Analytics by Murtaza Haider and Conrad Chavez, Pearson Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013 Fundamentals of Statistics-S.C.Gupta& V.K Kapoor,Sultan Chand & Sons
Module II Regression: Linear Regression, Logistic Regression Multivariate Data Analysis, Parametric Estimation Probability Distribution: Normal, Binomial, Poisson, Gaussian, Uniform distribution Testing Methods: Testing of Hypothesis: T-test, F-test, Chi square test.	10-19	Fundamentals of Statistics-S.C.Gupta& V.K Kapoor,Sultan Chand & Sons Probability and Statistics-Murray R Spiegel,John J Schiller,R Alu Srinivasan Schaum's Outlines-Third Edition Thomas A. Powell, "HTML & CSS: The Complete Reference", Fifth Edition, McGraw Hill.
Module III Introduction to Machine learning, Difference between Artificial intelligence, Machine Learning, Deep Learning Types of Machine Learning –Supervised learning, Unsupervised, Reinforcement learning. How Machine learning works, examples of machine learning applications	22-28	Introduction to Machine Learning, Ethem Alpaydin,Second Edition
Module IV Introduction to Data Mining Introduction to Clustering and Classification Discriminant functions, Parametric method-Maximum Likelihood estimation K Nearest Neighbour algorithm Support Vector Machine	25-31	Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006

Module V: Feature extraction and selection. Entropy minimization feature selection through function approximation, Binary feature selection Dimensionality Reduction: Problems of dimensionality, Principle component Analysis Real time application of Data science-Banking, Finance: Fraud and Risk Detection, Manufacturing, Transportation, Health care, E-Commercce: Targeted Advertising	34-42	Getting Started With Data Science: Making Sense Of Data With Analytics by Murtaza Haider and Conrad Chavez, Pearson Introduction to Machine Learning, Ethem Alpaydin,Second Edition The elements of Statistical Learning, Data Mining, Inference, and Prediction. Trevor Hastie,Robert Tibshirani,Jerome Friedman

Recommended Books & Reading List

1. Getting Started With Data Science: Making Sense Of Data With Analytics by Murtaza Haider and Conrad Chavez, Pearson
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, Wiley, 2013.
3. Fundamentals of Statistics-S.C.Gupta& V.K Kapoor,Sultan Chand & Sons
4. Probability and Statistics-Murray R Spiegel,John J Schiller,R Alu Srinivasan Schaum's Outlines-Third Edition
5. Data Mining Concepts and Techniques – Jiawei Han and Micheline Kamber, Second Edition, Elsevier, 2006
6. Soft Computing for Data Mining Applications- K. R. Venugopal, L. M. Patnaik, K.G Srinivasa · 2009-Springer
7. Introduction to Machine Learning, Ethem Alpaydin,Second Edition
8. The elements of Statistical Learning, Data Mining, Inference, and Prediction. Trevor Hastie,Robert Tibshirani,Jerome Friedman

IMCA9C04 IT INFRASTRUCTURE MANAGEMENT

Course overview

Program	IMCA
Semester	9
Course Code	IMCA9C04
Course Title	IT Infrastructure Management
Type of Course	Core
Contact Hours	4 hours per week
Credit	4

Course Description

Infrastructure management in IT plays very critical role in Managing IT investments. The course intends to introduce the concept of IT infrastructures from a technological and management perspective so as to give the students an exposure in understanding, building and managing efficient, available and cost-effective infrastructures. The importance of using ITIL in the process of designing and building IT infrastructure is covered elaborately in the syllabus and also Service level management using SLA's.

Course Objectives

By the end of the course the students will be able to:

1. Provide the knowledge to enhance the skill and competency of students in managing IT infrastructure to achieve stable, efficient and cost-effective infrastructures.
2. Disseminate knowledge required for developing and implementing infrastructure system management processes that will assure reliability, availability etc. Understand the structure and relevance of SLA's.
3. Understand various processes in infrastructure systems management like Performance Tuning, , Change Management, Incident Management, Storage, Network, and Configuration Management, Capacity Planning, Strategic Security and Disaster Recovery.

Course Outcomes

On successful completion of the course, the students will be able to:

CO.No	Course Objective Description
IMCA9C04.1	Define and identify various terms related to Infrastructure Management.
IMCA9C04.2	Learn SLA's, Incident management, concept of building cost-effective infrastructure. Concept behind ITIL
IMCA9C04.3	Analyze the technology to build and design infrastructures using ITIL for the same.
IMCA9C04.4	Design a infrastructure plan.
IMCA9C04.5	Evaluate terms like TCO, security and effectiveness.

Detailed Syllabus

Topic	Session	Reference
MODULE I INFRASTRUCTURE MANAGEMENT OVERVIEW: Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment, Total cost of complexity issues, Value of Systems management for business.	1-6	Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013 Phalguni Gupta, Surya Prakash, Umarani Jayaraman, IT infrastructure and its management
MODULE II PREPARING FOR INFRASTRUCTURE MANAGEMENT: Factors to consider in designing IT organizations and IT infrastructure , Determining customer's Requirements, Identifying System Components to manage, Exist Processes, Data, applications, Tools and their integration, Patterns for IT systems management, Introduction to the design process for information systems, Models, Information Technology Infrastructure Library (ITIL).	7- 15	Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013
MODULE III SERVICE DELIVERY PROCESSES: Service-level management, financial management and costing, IT services continuity management, Capacity management, Availability management.	19-26	Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013
MODULE IV SERVICE SUPPORT PROCESSES: Configuration Management , Service desk, Incident management, Problem management, Change management, Release management.	27-32	Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013
MODULE V STORAGE AND SECURITY MANAGEMENT: Introduction Security, Identity management, Single sign-on, Access Management, Basics of network security, LDAP fundamentals, Intrusion detection, firewall, security information management. Introduction to Storage, Backup & Restore, Archive & Retrieve, Space Management, SAN & NAS, Disaster Recovery, Hierarchical space management, Database & Application protection, Baremachine recovery, Data retention.	34-40	Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013 Manoj Kumar Choubey, Saurabh Singhal, IT Infrastructure and Management

Recommended Books and Reading List

1. Sjaak Laan, IT Infrastructure Architecture- infrastructure building blocks and concept, Lulu Com 2013
2. Manish Mahajan, Shikha Gupta, IT infrastructure and management
3. Phalguni Gupta, Surya Prakash, Umarani Jayaraman, IT infrastructure and its management
4. Manoj Kumar Choubey, Saurabh Singhal, IT Infrastructure and Management

IMCA9E04 (a) ELECTIVE IV- APPLICATION DEVELOPMENT AND MAINTAINANCE

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9E04(a)
Course Title	Application Development and Maintainance
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

The course introduces pragmatic programming concepts and continous software delivery of projects. It also make the students introduces the concept of GIT and able to use it.

Course Objectives

By the end of the course the students will be able to:

1. To impart the practical aspects of Application Development and Maintenance
2. To emphasizes the pragmatic and practical aspects of building industry ready applications
3. To understand and adhere to best practices while developing applications
4. To understand the basics of continuous development and focus on industry practices around continuous integration and continuous development

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA9E04(a).1	Student will be able to define the basics of software delivery ,deployment, testing and development.
IMCA9E04(a).2	Students will be able to differentiate the best practices of software development.
IMCA9E04(a).3	Students will be able to apply pragmatic programming concepts
IMCA9E04(a).4	Students will be able to create applications using all the aspects of pragmatic programming concepts
IMCA9E04(a).5	Students will be able to explain different concepts of continuous delivery and pragmatic projects.

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`Detailed Syllabus:

Topic	Session	References
Module I Principles of Software Delivery – Configuration Management – Introduction to Continuous Integration - Implementing a Testing Strategy	1-8	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Part I, Chapters 1, 2, 3,4)
Module II Using Git for version Control – Leveraging Github.com repositories for projects/Assignments – Getting Started with Git – Working with Git- Organizing Your Repository with Branches and Tags – Working in a team – Branches and Merging – Git History - Fixing Commits	9-16	Pragmatic Guide to Git: (Part I, 2, 3,4,5,6,7)
Module III Introduction to the Deployment Pipeline – Different Stages of Deployment Pipeline – Scripting for Deployment stages -Details of Commit Stage	17-23	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Part II, Chapters 5, 6,7)
Module IV Automated Testing – Testing for Non Functional Requirements – Deploying and releasing applications	24-33	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Part II, Chapters 8,9,10)
Module V Best practices for Software Development –Practical Approach in Software development- The Basic Tools	34-38	The Pragmatic Programmer: From Journeyman to Master (Chapter I, 2, 3, 4)

Recommended Books & Reading List

1. Andrew Hunt, David Thomas, “The Pragmatic Programmer: From Journeyman to Master”, Addison-Wesley Professional, 1999
2. Jez Humble, David Farley, “Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation”, Addison-Wesley Professional, 2010
3. Travis Swicegood, “Pragmatic Guide to Git”, Pragmatic Bookshelf, 2010

IMCA9E04 (b) ELECTIVE IV- SOFTWARE TESTING

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9E04(b)
Course Title	Software Testing
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course will take you through the process of software testing which includes planning, scheduling, test scenarios, error analysis and so on. It includes various types of testing like performance testing, regression testing, text execution, preventive measures, generating test reports.

Course Objectives

By the end of the course the students will be able to:

1 Students will learn how to Designing various test cases and understanding the techniques involved
2 Skills needed for identifying and preventing defects
3 Log defect identification
4 To learn the functionality of automated testing tool Selenium.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA9E04(b).1	Students will be able to define various types of testing.
IMCA9E04(b).2	Students will be able to differentiate Whitebox Testing and Blackbox testing.
IMCA9E04(b).3	Students will be able to apply various testing techniques for testing a Software.
IMCA9E04(b).4	Students will be able to Create Test cases for testing a Software.
IMCA9E04(b).5	Students will be able to explain the importance of test automation tools.

Detailed Syllabus:

Topic	Session	References
Module I Fundamentals of Testing: What is Testing? Testing versus Debugging, Verification and Validation, Root Cause Analysis, Significance of Testing: Cost of Quality, Software Testing Principles, Testing Choices: In-house Testing, Outsourcing, Who does the testing ? Developers as testers, Independent testing team , Buddy testing	1-8	ISTQB Certification Study Guide, Dr. K.V.K.K. Prasad, Wiley-Dreamtech Press, Meyers, G.: The art of Software Testing, Wiley-Inter-Science.
Module II Test Case Design Techniques: **Black-box testing** techniques: Boundary Value Analysis (BVA) - Equivalence Partitioning (EP)- Decision table testing, State transition testing , Cause Effect graphing, **White-box testing** techniques: Statement Coverage , Decision Coverage , Branch Coverage , Path Coverage , Control flow testing , Data flow testing	9-17	ISTQB Certification Study Guide, Dr. K.V.K.K. Prasad, Wiley-Dreamtech Press
Module III Levels of Testing: Unit Testing , Module Testing, Integration Testing , System Testing , Acceptance Testing, Testing Approaches: Static Testing vs. Dynamic Testing , Positive Testing vs. Negative Testing, Top-down vs. Bottom-up testing.	18-23	ISTQB Certification Study Guide, Dr. K.V.K.K. Prasad, Wiley-Dreamtech Press,
Module IV Types of Testing: Smoke Testing, Interface testing, Use-case testing, Gorilla Testing, Alpha testing, Load testing Stress testing, Security testing, Maintenance testing , Acceptance testing, Documentation testing. Case study: Write a test case for testing a web application .	29-36	ISTQB Certification Study Guide, Dr. K.V.K.K. Prasad, Wiley-Dreamtech Press
Module V Software test automation – What is Test Automation-skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Introduction to Automation Tool - Selenium	37-42	Software Testing Principles and Practices by Srinivasan Desikan and Gopalaswamy Ramesh Selenium 2 Testing Tools: Beginner's Guide

Recommended Books & Reading List

1. ISTQB Certification Study Guide, Dr. K.V.K.K. Prasad, Wiley-Dreamtech Press, ISBN: 9788177227116
2. Meyers, G.: The art of Software Testing, Wiley-Inter-Science.
3. Adithya P. Mathur, " Foundations of Software Testing - Pearson Education, 2008
4. Introducing Software Testing Louise Tamres
5. Boris Beizer, " Software Testing Techniques" , Dream Tech Press, 2009
6. Selenium 2 Testing Tools: Beginner's Guide

IMCA9E04 (c) ELECTIVE IV- CUSTOMER RELATIONSHIP MANAGEMENT

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9E04(c)
Course Title	Customer Relationship Management
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course is focused on the holistic understanding of customer relationship management. It will help the students to understand the role and importance of CRM in customer centric, marketing cum services continuum and designing innovative strategies with technological support for long-term customer retention.

Course Objectives

By the end of the course the students will be able to:

1. Understand the fundamentals of CRM
2. Recognize the basic technological infrastructure and organizations involved in current and emerging CRM practices
3. Appreciate the role and changing face of CRM as an IT enabled function

Course Outcomes

On successful completion of the course students will be able to :

CO.No	Description
IMCA9E04(c).1	Understand and describe a customer relationship management application,
IMCA9E04(c).2	Examine the techniques which are required to develop network application/ internet based application.
IMCA9E04(c).3	Implement how CRM practices and technologies enhance the achievement of marketing, sales and service.
IMCA9E04(c).4	Critically analyze an organization’s relational strategies with stakeholder groups
IMCA9E04(c).5	Evaluate CRM implementation strategies

Detailed Syllabus:

Topic	Session	References
Module I Introduction Definition of CRM, CRM as a business strategy, elements of CRM, History of CRM, Schools of thoughts on CRM, Relationship Pyramid, Dynamics of Customer Supplier Relationships, Nature and context of CRM.Strategy and Organization of CRM: strategy, The relationship oriented organization: Mission, Culture, Structure, People, Communication & Information Systems.	1-9	Peelan, E. (2005). Customer Relationship Management. Pearson Education. ISBN: 978-0273681779 .
Module II Customer Knowledge: Value of Customer knowledge, The utilization of data as an asset, From Data to Customer Knowledge, Privacy, Personal Data Protection, Information Policy, Communication & Multi-channels.The Individual Customer Proposition: Customization, Individualization of the product offering, Individualized pricing policy	10-17	Peelan, E. (2005). Customer Relationship Management. Pearson Education. ISBN: 978-0273681779
Module III Introduction to Relationship Policy: Relationship Policy Per Segment, Relationship policy by relationship phase, The Relationship Policy Translating the relationship policy into contact moments. Relationship data management: Customer Identification, Expanding the size of the customer database, Customer profiling.	18-25	Peelan, E. (2005). Customer Relationship Management. Pearson Education. ISBN: 978-0273681779
Module IV Data analyses & Data mining, Segmentation & Selections, Retention cross-selling. Evaluating the effect of marketing activities on the customer value, Lifetime value, Alternatives for lifetime value, Balanced scorecard, Reporting Results.Call centre management, Internet and website, Direct mail, Effective direct mail message. CRM Subsystems: Contact Management, Campaign Management. Sales Force Automation Choosing CRM Tools / Software Package: Short listing prospective CRM vendors, setting evaluation criteria for the appropriate CRM package, selection CRM implementation	26-36	Peelan, E. (2005). Customer Relationship Management. Pearson Education. ISBN: 978-0273681779
Module V CRM systems and Implementation, Implementation of CRM systems Applications in various industries: Applications in manufacturing, banking hospitality and telecom Sectors, Ethical issues in CRM Past, Present and Future of CRM.	37-40	Peelan, E. (2005). Customer Relationship Management. Pearson Education. ISBN: 978-0273681779 Jagdish N Sheth, Parvatiyar Atul, G Shainesh, Customer Relationship Management: Emerging Concepts, Tools and Applications, 1st Edition, Tata McGraw Hill, June 2008

Recommended Books & Reading List

1. Peelan, E. (2005). Customer Relationship Management. Pearson Education. ISBN: 978-0273681779

2. Jagdish N Sheth, Parvatiyar Atul, G Shainesh, Customer Relationship Management: Emerging Concepts, Tools and Applications, 1st Edition, Tata McGraw Hill, June 2008

3. Judith W .Kincaid , Customer Relationship Management Getting it Right, Pearson Education

4. .H.Peeru Mohamed , A Sagadevan, Custmer Relationship Management, A Step by Step Approach, Vikas Publishing House

5. Customer Centricity –Focus on right customer for strategic advantage, by Peter Fader, Wharton Digital Press, 2012

IMCA9E04(d) ELECTIVE IV- INFORMATICS AND CYBER ETHICS

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9E04(d)
Course Title	Informatics and Cyber Ethics
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course covers ethical and professional issues that arise in designing and using networked information technologies and information resources. It examines frameworks for making ethical decisions, emergent technologies and their ethical implications, and information and computer professionalism.

Course Objectives

The aim of the course is not to tell what to think about ethical issues, but on the proper views in computing ethics .

1. Develop mature stances with regard to issues of professional ethics in general , computing ethics in particular.
2. Present these stances in a manner that is persuasive to your peers, the most important audience for the articulation of your ethical views.

Course Outcomes

On successful completion of the course students will be able to :

CO.No	Description
IMCA9E04(d).1	Students identify statutory, regulatory, constitutional, and organizational laws that affect the information technology professionally.
IMCA9E04(d).2	Students locate and apply case law and common law to current legal dilemmas in the technology field.
IMCA9E04(d).3	Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
IMCA9E04(d).4	Students distinguish enforceable contracts from non-enforceable contracts.
IMCA9E04(d).5	Students analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professionally.

Detailed Syllabus:

Topic	Session	References
Module I The Internet, TCP/IP, IP Addressing, Client Server Communication, Intranet, WWW, Web Browser and Web Server, Hyperlinks, URLs, Electronic mail	1-8	Alan Evans, Kendall Martin, Mary Anne Poatsy - "Technology in Action", Pearson
Module II Internet as a knowledge repository, academic search techniques, creating cyber presence. Academic websites, open access initiatives, opens access publishing models, Introduction to use of IT in teaching and learning -Educational software, Academic services–INFLIBNET, NPTEL, NICNET, BRNET	9-18	Alan Evans, Kendall Martin, Mary Anne Poatsy - "Technology in Action", Pearson .
Module III Introduction to purchase of technology, License, Guarantee, Warranty, Basic conceptsof IPR, copyrights and patents, plagiarism. IT & development, the free software movement	18-28	Alan Evans, Kendall Martin, Mary Anne Poatsy - "Technology in Action", Pearson .
Module IV Cyber space, information overload, cyber ethics, cyber addictions, cybercrimes–categories –person, property, Government–types-stalking, harassment, threats, security & privacy issues	29-36	Barkhs and U. Rama Mohan - HTML Black Book 3. "Cyber Law Crimes", Asia Law House, New Edition
Module V Cyber Addiction, Information Overload, Health Issues, e-Waste and Green computing impact of IT on language & culture-localization issues- Unicode- IT and regional languages e-Governance in India, IT for National Integration, Role of IT.	37-42	Barkhs and U. Rama Mohan - HTML Black Book 3. "Cyber Law Crimes", Asia Law House, New Edition

Recommended Books & Reading List

1. Alan Evans, Kendall Martin, Mary Anne Poatsy - "Technology in Action", Pearson
2. Dinesh Maidasani "Learning Computer Fundamentals, MS Office and Internet &

Web Technology", Firewall Media, Lakshmi Publications.
3. V Rajaraman - "Introduction to Information Technology", Prentice- Hall of India.
4. Barkhs and U. Rama Mohan - HTML Black Book 3. "Cyber Law Crimes", Asia Law

House, New Edition
5. Peter Nortons- Introduction to Computers, Sixth Edition, Published by Tata

McGraw Hill

IMCA9E04 (e) ELECTIVE IV- MACHINE LEARNING

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9E04(e)
Course Title	Machine Learning
Type of Course	Elective
Contact Hours	4 hours per week
Credit	4

Course Description

This course provides a broad introduction to machine learning and statistical pattern recognition. Unsupervised learning, learning theory, reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning.

Course Objectives

By the end of the course the students will be able to:

1. To introduce the basic concepts and techniques of Machine Learning.
2. To develop skills for using machine learning algorithms for solving practical problems.
3. To develop skills for using standard machine learning libraries.

Course Outcomes

On successful completion of the course:

CO.No	Description
IMCA9E04(e).1	Students will be able to introduce the basic concepts and techniques of Machine Learning.
IMCA9E04(e).2	Students will be able to to develop skills for using machine learning .
IMCA9E04(e).3	Students will be able to apply algorithms for solving practical problems
IMCA9E04(e).4	Students will be able to to create skills for using standard machine learning libraries.
IMCA9E04(e).5	Students will be able to differentiate concepts of machine learning algorithms.

Detailed Syllabus:

Topic	Session	References
Module I Introduction to Machine Learning - How do machines learn - Feature Selection, Understanding data:- numeric variables – mean, median, mode, Measuring spread. Review of distributions: Uniform and normal. Categorical variables. Dimensionality Reduction.	1-8	Brett Lantz, "Machine Learning with R", Packt Publishing, 2nd Edition.
Module II Lazy Learning - Classification Using k-Nearest Neighbor algorithm. Measuring similarity. Choice of k. Probabilistic Learning - Naive Bays' classifier. Review of probability - Joint probability, Conditional probability and Bay's theorem, Naive Bayes algorithm.	9-18	Brett Lantz, "Machine Learning with R", Packt Publishing, 2nd Edition. Tom Micheal, "Machine Learning", Mcgraw Hill (1997)
Module III Classification Using Decision Trees and Rules - Divide and conquer strategy. Decision tree algorithm. Regression Methods - Simple linear regression - Ordinary least squares estimation Correlations - Multiple linear regression	18-28	Brett Lantz, "Machine Learning with R", Packt Publishing, 2nd Edition. Tom Micheal, "Machine Learning", Mcgraw Hill (1997).
Module IV Neural Networks: Biological motivation - Perceptron - Activation functions - Network Models. Support Vector Machines - Review of finite dimensional vector spaces - Hyper planes - Support Vector Classifier. Kernel methods .	29-36	Brett Lantz, "Machine Learning with R", Packt Publishing, 2nd Edition. Tom Micheal, "Machine Learning", Mcgraw Hill (1997)
Module V Evaluating Model Performance: Precision and recall, Confusion matrix, Cross validation Bootstrap sampling, Improving model performance with ensemble learning, Bagging and Boosting. Introduction to random forest	37-42	Brett Lantz, "Machine Learning with R", Packt Publishing, 2nd Edition. Tom Micheal, "Machine Learning", Mcgraw Hill (1997)

Recommended Books & Reading List

1. Brett Lantz, "Machine Learning with R", Packt Publishing, 2nd Edition.
2. Tom Micheal, "Machine Learning", Mcgraw Hill (1997)
3. Vinod Chandra S S, Anand Hareendran S., "Artificial Intelligence and Machine Learning", Prentice Hall (2014)
4. Simon Rogers, Mark Girolami, "A First course in Machine Learning", CRC Press, First Indian reprint, 2015.
5. N P Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 1st Edition.
6. E. Alpayidin, "Introduction to Machine Learning", Prentice Hall of India (2005)
7.T. Hastie, RT Ibrashiran and J. Friedman, "The Elements of Statistical Learning", Springer 2001
8. Toby Segaran, "Programming Collective Intelligence: Building Smart Web 2.0 Applications", O'Reilly Media; 1 edition (16 August 2007).
9. Drew Conway, John Myles White, "Machine Learning for Hackers: Case Studies and Algorithms to Get You Started", O'Reilly Media; 1 edition (13 February 2012)
10. Christopher Bishop, "Pattern Recognition and Machine Learning (Information Science and Statistics)", Springer 2011 edition (15 February 2010)
11. Machine Learning - Course Materials @ http://cs229.stanford.edu/materials.html

IMCA9P05 DATA SCIENCE PRACTICALS

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9P05
Course Title	Data Science Practicals
Type of Course	Core
Contact Hours	4 hour per week
Credit	2

Course Description

This course provide adequate knowledge in the application of various data science algorithms in the programming languages of R and Python. Students can apply the techniques and tools to solve real time application problems.

Course Objectives

By the end of the course the students will be able to:

1. To provide knowledge of different data preprocessing activities.
2. To impart knowledge about various statistical applications using R.
3. To equip students to understand, utilize and visualize the data by applying the tools of Python.
4. Develop programs for predictive analytics.

Course Outcomes

On successful completion of this course :

CO.No	Course Objective Description
IMCA9P05.1	Students will be able to understand the methods of data preprocessing.
IMCA9P05.2	Students will be able to apply different functions of R programming language for computing statistical values computing statistical compiler writing tools to implement the different Phases.
IMCA9P05.3	Students will be able to analyze the data for retrieving knowledge.
IMCA9P05.4	Students will be able to implement the machine learning algorithms.
IMCA9P05.5	Students will be able to evaluate the validity of hypothesis by various testing methods.

Detailed Syllabus:

Topic	Session	References
Module1 Handling data in Data Science Introduction to Data Science. Exploring data analysis with Pandas :Accessing and preparing data - Reading a file ,indexing, selecting a subset. Data preprocessing with python:-Dropping columns in a dataframe, Changing the index of a dataframe, Cleaning columns and data, Renaming columns and skipping rows.	1-8	Python Data Science Handbook, Jake Vanderplas
Module II Numerical analysis using NumPy:-Handling arrays and analysing data. Data Visualization and Machine Learning algorithms-Data visualization with Matplotlib :-Understanding the plot, Creating 2-D plots, Multiple plots, Types of plots.	9-17	Python Data Science Handbook, Jake Vanderplas.
Module III Linear Regression: -Simple and Multiple regression using python Machine Learning algorithm implementation with Scikit-learn Implementation of any one Classification & Clustering Algorithm Testing of Hypothesis	19-25	Python Data Science Handbook, Jake Vanderplas
Module IV Preprocessing using R Data frames using R Data visualisation	26-33	R for Data Science Hadley Wickham & Garrett Grolemund O'Reilly .
Module V Linear and Multiple Regression using R Hypothesis testing Introduction to text Mining	34-40	R for Data Science Hadley Wickham & Garrett Grolemund O'Reilly

Recommended Books & Reading List

1. Python Data Science Handbook, Jake Vanderplas
2. R for Data Science ,Hadley Wickham & Garrett Grolemund O'Reilly

Lab Record Programs

Develop the following programs using Python tools:

1. Develop program to execute various functionalities of arrays.
2. Develop program to empower data analysis using data frames.
3. Execute various inferential statistical distributions. (preferably Normal, Binomial, Poisson)
4. Compute Correlation Coefficient
5. To apply various hypothesis testing methods(preferably F-test, T test, Chi-square,Z-test)
6. Develop the program to execute any one classification algorithm.
7. Develop a program to apply regression technique for prediction.
8. Presenting the analysis through visualization tools.

Develop the following programs using R :

9. Develop program to execute various functionalities of arrays.
10. Develop program to empower data analysis using data frames.

11. Execute various inferential statistical distributions. (preferably Normal, Binomial, Poisson)
12. Compute Correlation Coefficient
13. To apply various hypothesis testing methods(preferably F-test, T test, Chi-square, Z-test)
14. Develop the program to execute any one classification algorithm.
15. Develop a program to apply regression technique for prediction.
16. Presenting the analysis through visualization tools.

Application Project:

17. Apply the tools and techniques in any one real time application.

IMCA9P06 CLOUD COMPUTING PRACTICALS

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9P06
Course Title	Cloud Computing Practicals
Type of Course	Core
Contact Hours	2 hours per week
Credit	2

Course Description

Basic objective of this course is to enable the students to build basic and advanced web applications using various web programming languages.Students need not have prior familiarity with web programming, but they must have the basic knowledge of computer programming in order for this course to be successful.

Course Objectives

By the end of this course students will be able :

1. To build basic web applications using HTML.
2. To enhance the web applications build using HTML with CSS.
3. To understand XML and performing validation of XML file using DTD and Schemas.
4. To create web applications using javascript.
5. To create web applications using JSP and using MySQL to build database applications.
6. To create web applications using Ruby and understanding its object oriented concepts.
7. To Focus on building Ruby on Rails applications.

Course Outcomes

On successful completion of the course:

CO.No	Course Outcome Description
IMCA9P06.1	Students will be able to define the web programming concepts.
IMCA9P06.2	Students will be able to develop and explain web programming.
IMCA9P06.3	Students will be able to apply programming logic to develop web applications.
IMCA9P06.4	Students have the ability to examine and test different web technologies.
IMCA9P06.5	Students will be able to design and construct applications based on different web technologies.

Detailed Syllabus:

Topic	Session
Create an HTML page to demonstrate lists and tables.	1-2
Create an HTML page using frames.	3-4
Create an image gallery using CSS.	5-6
Create an HTML form and style it using CSS.	7-8
Create an XML file and validate it using XML DTD.	9-10
Create an XML file and validate it using XML Schema.	11-12
Create javascript application using arrays and functions.	13-14
Create javascript application by implementing Date and Math related objects.	15-16
Create a javascript application that demonstrates form validation which includes text field, radio buttons, check boxes, list box and other controls.	17-21
Create a web application using JSP.	22-23
Create a JSP application to demonstrate sessions.	24-25
Create a JSP application to demonstrate cookies.	26-27
Create a database application using JSP and MySQL.	28-30
Create a JSP application to demonstrate java beans.	31-32
Create a ruby program to demonstrate classes and objects.	33
Create a ruby program to demonstrate inheritance.	34-35
Create a ruby program to demonstrate overriding.	36
Create a ruby program to demonstrate modules.	37
Create a ruby program to demonstrate mixins.	38-39
Create a database application using Rails.	40-42

Recommended Books & Reading List

1. Tanweer Alam, “Introduction to Web Technology“, Khanna Book Publishing.
2. Xavier. C, “Web Technology and Design”, New Age International.
3. Thomas A. Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, McGraw Hill.
4. Kris Hadlock, “Ajax for Web Application Developers”, SAMS Publishing.
5. Thomas Powell, “Javascript: The Complete Reference”, Tata McGraw-Hill.
6. Brad Dayley, “Node.js, MongoDB, and Angular JS Web Development”, Addison Wesley.
7. Jason Brittain, Ian F Darwin, “Tomcat The Definitive Guide”, O’Reilly.
8. Hans Bergsten, “Java Server Pages”, O’Reilly.
9. Phil Hanna, “JSP The Complete Reference”, Osborne/McGraw-Hill.
10. Steven Holzner, “Beginning Ruby on Rails”, Wiley Publishing.

IMCA9S02 MAIN SEMINAR- CURRENT TRENDS

Course Overview

Program	IMCA
Semester	9
Course Code	IMCA9S02
Course Title	Main Seminar – Current Trends
Type of Course	Core
Contact Hours	2 hours per week
Credit	2

Course Description

This course is intended to make IMCA students aware of the Current / Future trends related to Information Technology/ Computer Science/ Computer Application.

As such, a seminar report of not less than 15 pages is to be prepared and submitted for final evaluation.

The Seminar is to be evaluated internally by the College and carries a total Marks of 100 divided as follows:

1. Marks for relevance of topic (20)
2. Marks for literature study (20)
3. Marks for each Presentation (20)– 2 presentations (40)
4. Marks for Seminar Report (20).

The seminar report should be prepared as per the following guidelines:

1. No of pages: Not less than 15 pages.
2. Size A4, One sided.
3. Text Size 12; Title Size 14 Underlined; Line spacing: 1.5 Full Justified
4. Spiral Binding with uniformity in bind cover.

Every student is expected to present a minimum of 2 presentation of the seminar before the evaluation committee and for each presentation marks can be equally apportioned. A three-member committee consisting of qualified TEACHERS with PG in Computer Science / Computer Application from the MCA Department has to be appointed by Head of Department. The Committee duly appointed will evaluate the seminar. At the end of the semester the total marks have to be calculated and send to the University. A Student shall have to score 50 % for getting a pass in the Seminar.

IMCAXCP3- MAIN PROJECT-APPLICATION DEVELOPMENT

Course Overview

Program	IMCA
Semester	10
Course Code	IMCAXCP3
Course Title	Main Project- Application Development
Type of Course	Core
Contact Hours	4 hours per week
Credit	8

Course Description

Guidelines for Project Work- June 2020 Admn. onwards

The Master of Computer Applications (MCA) programme prepares the students to take up positions as Systems Analysts, Systems Designers, Software Engineers, Programmers and Project Managers in any field related to information technology. As part of the curriculum, all students who are into their sixth semester will have to carryout a project preferably in a software industry or any research organization for duration of one full semester. The courses studied and the mini project & the main project handled at final year will give the comprehensive background to work on diverse application domains.

The objective of the MCA project work is to develop quality software solution. During the development of the project, the student should involve in all the stages of the software development life cycle like requirements engineering, systems analysis, systems design, software development, testing strategies and documentation with an overall emphasis on the development of reliable software systems. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices, so as to participate and manage a large software engineering projects in future. Students should take this project work **very seriously**, and carry out the same individually. The topics selected should be complex and large enough to justify as an MCA project. The project should be genuine and original in nature and should not be copied from anywhere else.

After the completion of this project work, the student will be able to:

i. Describe the Systems Development Life Cycle (SDLC).
ii. Evaluate systems requirements.
iii. Complete a problem definition and its evaluations.
iv. Construct and evaluate UML's/Data flow diagrams and Data Dictionaries
v. Evaluate alternative tools for the analysis process.
vi. Create and evaluate such alternative graphical tools as systems flow charts and state transition diagrams.
vii. Plan the systems design phase of the SDLC.
viii. Distinguish between logical and physical design requirements.

ix. Design and evaluate system Inputs & outputs and UI.
x. Decide various data structures.
xi. Perform coding for the project.
xii. Documentation requirements and prepare and evaluate systems documentation.
xiii. Generate various reports.
xiv. To decide the future scope and further enhancement of the system.
xv. Develop of the ability to assess the implications of work performed.
xvi. Get good exposure and command in one or more application areas and on the software
xvii. Develop of the ability to communicate effectively.

All students are expected to work on a real-life project preferably in some Industry / Research and Development Laboratories / IT-ITES Organisations. The complete project work should be done by the student only. The role of guide should be about guidance wherever any problem encounters during project.

i) **Not more than one student is permitted to work on a project**.
ii) Each Student should be involved in each and every phase of Project Development. If it is found that student is not involved in any phase; for example, coding phase, it may lead to the rejection/disqualifying of the project at any stage.
iii) Title of the project should be kept the same throughout the project.

Guidelines for preparing the Project Dissertation

This document lists the contents required for the academic project report done as part of the MCA Curriculum. Section names have been listed with description. The descriptions have been provided in italics. *Important: This page and the text in italics present throughout this document are to give you guidance. Please do not include them in your project report.*

CONTENTS OF THE ACADEMIC PROJECT REPORT

1. Cover Page as per format
Use the same format given in the project doc

2. Certificate of the Company/Organization
Use the same format given in the project doc

3. Certificate of the Head Of Department as per format
Use the same format given in the project doc

4. Certificate of the Internal project guide as per format
Use the same format given in the project doc

5. Declaration
By student – format given

6. Acknowledgement
Use the same format given in the project doc

7. Revision history
Table with version, date, author, changes done, approval

8. Table of Contents
Please use the MS Word Table of content feature for this and not a manual TOC.

9. Executive Summary

This should describe the problem and the solution given by your project in brief. You should also mention the process model you used for development, methodology and technology. Limit the description to 1-2 pages.

10. Background

UP Phase: Inception

10.1. Existing System

Describe the system that already exists. Please note that the system could be manual or automated or a combination of both. Provide the business flow using an activity diagram.

10.2. Definition of Problem-

Describe the problems/inadequacies of current set up.

10.3 Proposed System

Explain how the proposed system will solve the problems.

Provide the revised business flow involving your system using an activity diagram, if relevant.

11. Project Overview

UP Phase: Inception

11.1. Objective of the Project

Describe the business benefits expected from this project.

11.2. Stakeholders

List the stakeholders, their goals which will be satisfied by this system and the benefits.

11.3. Scope of the Project

Mention in brief the system proposed to meet the objective. Mention clearly if any part of the work is not in your scope – e.g. installation, or some data migration required for implementation of this system, integration with some other system etc.

11.4 Feasibility Analysis

11.4.1.Technical feasibility

Technology and system feasibility - The assessment is based on an outline design of system requirements in terms of Input, Processes, Output, Fields, Programs, and Procedures. This can be quantified in terms of volumes of data, trends, frequency of updating, etc. in order to estimate whether the new system will perform adequately or not

11.4.2.Operational feasibility

Is a measure of how well a proposed system solves the problems, and takes advantages of the opportunities identified during scope definition and how it satisfies the requirements identified in the requirements analysis phase of system development

11.4.3.Schedule feasibility

Schedule feasibility is a measure of how reasonable the project timetable is.

11.5.4. Economic feasibility - Cost - Benefit Analysis

If the company had already done the analysis before deciding on the project, then obtain the information from the company and just mention it here. If this analysis was performed by the student, then

explanation of how the analysis was conducted should be provided. The analysis aims to determine the benefits and savings that are expected from a candidate system and compare them with costs.

12. Overall Project Planning

UP Phase: Inception

12.1. Development environment

Identify and list the technology and tools planned to be used in the development of the project – IDEs, compilers, UML tool, configuration management tool etc.

12.2. Constraints

List the constraints applicable to your project e.g. time constraints, budget constraints, resource constraints, any other constraints set by the customer.

12.3. Deliverables

List all deliverables expected by the customer – e.g. application, configuration files, source code, any 3rd party software packaged along with this, documents – requirements, design, user manual, installation manual, tutorial – as applicable for your project.

12.4. Assumptions and dependencies

List the assumptions and dependencies made while planning the project, eg .there could be an assumption that the required inputs will be given by users or that users will be available to review the documents or that the testing team will be available to test if required etc.

12.5. Risks

List any risks you foresee in the execution of this project and describe the plan to mitigate it.

12.6. Process model

Mention which process model you chose to develop this project and the justification for it.

12.7. Test Strategy

Mention all testing strategies – unit, integration, system, user acceptance testing that have been used.

12.8. Testing environment and tools

The environment for testing should give the specifications of hardware and software used for testing. Tools used for testing if any, should be listed here.

13. Iteration Planning

UP Phase – Each iteration in each phase

13.1. Schedule

Put the schedule here – activities, dependencies, start and end dates.

13.2. Risks

List any risks you foresee in the execution of this iteration and describe the plan to mitigate it.

14. High level system Analysis

UP Phases: Inception

This analysis will be performed completely during inception and will be continued to be revised in the elaboration stage.

14.1. User characteristics

Mention the different types of users or user groups of the proposed system and any special training needs they have in order to use this system.

14.2. Summary of system features/Functional requirements

List the features identified to be part of this system in order to satisfy this goal.

14.3. Non Functional Requirements / Supplementary Specification

List the non functional requirements applicable to your project related to performance, security etc.

14.4. Glossary

Define the business/domain terms specific to the context of this system

14.5. Business Rules

Define the business rules specific to the user's domain/organization that need to be satisfied by this system.

14.6. Use cases

List all the use case names here and a brief description of each use case.

14.7. Use case diagram

15. Domain Model

UP Phases: Inception and Elaboration

The initial model will be identified during elaboration and will be continued to be revised in the elaboration stage. Give the analysis level class diagram, i.e. the domain model here and a brief description of the analysis level classes.

16. Use Case Model

Relevant UP Phases: Inception and Elaboration

To be developed during inception for a critical few use cases and the remaining use cases (majority) will be developed during elaboration for the majority of the use cases.

16.1. Use case text

Write the detailed use case text, in the fully dressed format for each use case. Identify the non functional requirements and rules to be followed specific to the use case being considered. Also identify the user inputs in the form of text and file inputs to system (if any). Develop the format of input which the system will accept, with examples. If it is a file input, format of file and format of data within it (if relevant) have to be provided.

Develop error messages and information texts required as part of this use case. Any external system interface requirements also need to be identified

16.2. System sequence diagram

For each use case under consideration, draw the system sequence diagram(s).

16.3. Operation contracts

For each system sequence diagram under consideration, write up the operation contracts.

16.4. Reports

Develop the format of the reports generated as part of this use case, if any.

Design Model

UP Phases: Elaboration and Construction

Developed completely in elaboration and revised in construction phase.

16.5. Sequence diagrams

Develop the design level sequence diagrams for the use case under consideration.

16.6. Class diagrams

Develop the design level class diagram for the use case under consideration.

16.7. UI design

Develop the screens identified for the use case under consideration and provide snapshots. At this stage, static screens are sufficient.

16.8. Theoretical Background

Theoretical details about the technology, tools and algorithms you have used in this project should be mentioned here in brief.

16.9. Architecture

In this section, show pictorially the logical and deployment architecture of this system. Use package diagrams, component and deployment diagrams for this.

16.10. Database design

This should give a catalogue of the data elements used in the system / sub system developed. The following are the details require for each table and field in the table. Repeat this list as many times there are tables and fields. Write NA if NOT applicable:

16.10.1. Table Name

16.10.1.1. Field Name

16.10.1.2. Length

11.4.1.1 Type CHAR, VARCHAR, NUMBER, DATE etc.

11.4.1.2 Description

17. Testing

UP Phases: Construction and Transition

Developed completely in construction and revised in transition phase.

17.1. Test cases

List each test case – with description, inputs, expected output, pass/fail criteria.

17.2. Test Report

Actual result against the expected results of test cases should be compiled here. A measure of quality like

% of passed test cases should also be provided.

17.3. Sample Code used for testing

Sample code used for unit testing should be provided.

18. Transition

Relevant UP Phase: Transition

18.1. System Implementation

Describe the implementation mechanisms. Describe the method of data conversion and migration for the new system if applicable.

18.2. System Maintenance

Describe the plan for maintenance of the system. Mention the documents and any training provided by the student for future maintenance.

18.3. User/Operational Manual

If there was a user manual expected as deliverable by the customer, provide it here. If there was a demo or training given to users on the system, mention that. If there are any limitations of the system or constraints on inputs like data format, which have to be taken care by users, list it here. Also mention the details required for operation of the system. This should include instructions on how to start and shutdown the system, description of expected folder structure of system related files after installation, list of roles of users required to be created and maintained in the system.

If there are any requirements to do periodic cleaning of data, those have to be mentioned here. If the delivery of scripts or programs for automatic data cleaning is in scope, usage of the scripts should be

described. Configuration management related information, if applicable, should be provided to suggest frequency of backups of files.

19. Annexure :

19.1. Organization profile

Give a brief background of the organization where the student has developed the project

19.2. Document Glossary, Figures, Tables

List of abbreviations should be provided in the document glossary. Each figure and table should be labeled. You should create an index for these like the table of contents.

19.3. References :

Books: *Any references you made to books and papers should be listed here with the book name, edition, name of author and publisher.*

Websites: *Any references you made to websites should be listed here with the URL and date of access.*

19.4. User Interview Questionnaires

19.5. Sample Project code / Algorithm if project code is not available.

The format of various certificates to be included in the Project report is appended along with this guidelines.

Format of certificates to be attached in the project report

A Project Report

On

"PROJECT TITLE"

Submitted to the

Department of MCA

In partial fulfillment of the

MASTER OF COMPUTER APPLICATIONS

Under the guidance of

Internal Guide's Name

Project Done by

NAME OF STUDENT

(Reg No:)

EMBLEM OF COLLEGE

DEPARTMENT OF MCA

NAME AND ADDRESS OF COLLEGE

Month-Year

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

BONAFIDE CERTIFICATE

Certified that the Project Work entitled

"PROJECT TITLE"

is a bonafide work done by

Name of the student

In partial fulfillment of the requirement for the Award of

MASTER OF COMPUTER APPLICATIONS

Degree From

Mahatma Gandhi University, Kottayam

(Period of study)

Head of Department *Project Guide*

Submitted for the Viva-Voce Examination held on……

External Examiner1 **External Examiner2**

(Name & Signature) (Name & Signature)

NAME AND ADDRESS OF COLLEGE

EMBLEM OF COLLEGE

CERTIFICATE

This is to certify that the project entitled **"PROJECT TITLE"** has been successfully carried out by ***NAME OF STUDENT*** (Reg. No:) in partial fulfilment of the Course **Master of Computer Applications.**

INTERNAL GUIDE

Date: **HEAD OF THE DEPARTMENT**

NAME AND ADDRESS OF COLLEGE
EMBLEM OF COLLEGE

CERTIFICATE

This is to certify that the project entitled **"PROJECT TITLE"** has been successfully carried out by **NAME OF STUDENT** (Reg no:) in partial fulfilment of the course **Master of Computer Applications** under my guidance .

Date: Name of Guide

INTERNAL GUIDE

NAME AND ADDRESS OF COLLEGE
EMBLEM OF COLLEGE

DECLARATION

I, **NAME OF STUDENT**, hereby declare that the project work entitled **"NAME OF THE PROJECT"** is an authenticated work carried out by me at ***XYZ SOFTWARE PVT. LTD.*** under the guidance of **Guide's Name** for the partial fulfilment of the course **MASTER OF COMPUTER APPLICATIONS**. This work has not been submitted for similar purpose anywhere else except to **NAME OF COLLEGE.**

I understand that detection of any such copying is liable to be punished in any way the school deems fit.

NAME OF STUDENT

Date:

Place:

Signature

IMCAXCVV – VIVA VOCE

Course Overview

Program	IMCA
Semester	10
Course Code	IMCAXCVV
Course Title	Viva-Voce
Type of Course	Core
Contact Hours	2 hours per week
Credit	4

Course Description

The Viva-Voce Examination of Xth Semester is a comprehensive evaluation of what has been learned through the entire MCA programme.

Students will be evaluated through all core subjects of the MCA programme and marks will be awarded on the basis of oral answers given by the student.

There is no internal mark component for the same. The maximum marks for the Viva Voce examination is 100. The evaluation is done by the evaluators duly appointed by the University.

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