PROGRAMME GUIDE

FOR

MASTER OF COMPUTER APPLICATIONS (MCA)

July, 2020

SCHOOL OF COMPUTER AND INFORMATION SCIENCES
INDIRA GANDHI NATIONAL OPEN UNIVERSITY
MAIDAN GARHI, NEW DELHI - 110 068

www.ignou.ac.in

ePrograme Guide:

July, 2020. There is no programme related change. Thus, there is no change Programme Structure, Syllabus, counselling sessions, evaluation methodology etc.

Further information on the Indira Gandhi National Open University courses can be obtained from the University's office at Maidan Garhi, New Delhi-110 068 or from its Regional Centres spread across the length and breadth of the country.

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MESSAGE FROM THE PROGRAMME CO-ORDINATOR

Dear student,

Welcome to the family of distance learners and IGNOU's Master of Computer Applications Programme. It is a 3-year programme during which you will study a wide range of topics in Computer Science and Applications. You will receive support from IGNOU through the regional centre, study centre to which you will be allotted and also from IGNOU's website. We expect you to be directly in contact with us and your peers through the Internet also, at the email address given below.

This Programme Guide contains instructional system of IGNOU MCA programme, syllabus of MCA programme, details of evaluation scheme and links to assignments and other important information and forms. The course material is sent to you, to find the status of course material dispatch, you may refer to section 6.7. You can download the assignments of the semester in which you have enrolled from our website. Each course contains **only one assignment** that will be assessed by a counsellor at your study centre. All these assignments are to be submitted at your study centre within the stipulated time mentioned against last date of submission. In case a student needs the assignments **of previous semesters**, s/he can obtain a copy of the same from the IGNOU's website.

At your study centre you will be able to avail yourself of the counselling for all the courses. You need to have a minimum of 70% attendance for practical counselling sessions to be eligible for appearing for the Term-end Practical Examinations. You must also submit the assignments of every course before the due date to be eligible to appear for the related Term-end Examinations.

It is to be noted that the payments that are mentioned in various proformas/formats are as on date and is subject to revision from time to time. You are advised to keep checking with the website/study centre/regional centre for any revision/modification. **Some useful forms and formats (or the link to useful forms and formats) are also given at the end of this booklet. You may use the photocopies of those.** The Programme Guide, forms and formats are also available on the website. Please confirm the fees with the Regional Centre / Study Centre / Website before you pay.

As a distance learner, you may have several queries. You will find answers to many of them in this booklet. **This booklet is a very important guide for you. Read it and preserve it until you successfully complete the MCA programme.** This Programme Guide contains the information and forms related to the MCA programme. However, during your studies, if you have any feedback, suggestions and comments to make, please write to us immediately. In case, you have specific query, you can write to us on iGRAM (**http://igram.ignou.ac.in)**

Learners are advised to be in touch with their study centres for advice / timely / day-to-day information or visit the website with URL **www.ignou.ac.in**.

I wish you all the success in pursuing the MCA programme.

MCA Programme Coordinator
Email: mca@ignou.ac.in

1. BASIC INFORMATION

MCA Programme Objectives

The broad objective of the MCA programme is to prepare graduate students for productive careers in software industry and academia by providing an outstanding environment for teaching and research in the core and emerging areas of the discipline. The programme's thrust is on giving the students a thorough and sound background in theoretical and application-oriented courses relevant to the latest computer software development. The programme emphasizes the application of software technology to solve mathematical, computing, communications / networking and commercial problems.

This Master's Degree Programme has been designed with a semester approach in mind. The first year courses are aimed at skills development in computers using various technologies, the second year is more focused on core courses providing conceptual framework and the third year provides the specialisation and the project work.

Duration of the Programme
(Minimum - 3 Years, Maximum - 6 Years)

To fulfil the requirements for acquiring the MCA, a student may clear all the courses in a minimum of three years and a maximum of 6 years. In case the student is unable to pass all the courses of the MCA programme in 6 years. But, you are advised to pass all the courses successfully in 3 years.

Medium of Instruction

The medium of instruction is only **English.** The course material is also in English.

Credit System

The University follows the 'Credit System' for its programmes. Each credit is worth 30 hours of student study time, comprising all the learning activities. Thus, a four-credit course involves 120 study hours. This helps the student to understand the academic effort one has to put into successfully complete a course. **Completion of the programme requires successful completion of both assignments and the Term-End Examination of each course in the programme.**

MCA Programme Structure

The programme has been divided into two semesters per year (January to June and July to December). Consequently, there will be two examinations every year - one in the month of June for the January to June semester courses and the other in December for the July to December semester courses. The students are at liberty to appear for any of the examinations conducted by the University during the year subject to completing the minimum time framework and other formalities prescribed for the programme.

MCA Programme Structure

I SEMESTER				II SEMESTER		
Year	**Course Code**	**Course Title**	**Credits**	**Course Code**	**Course Title**	**Credits**
I	MCS-011	Problem Solving and Programming	3	MCS-021	Data and File Structures	4
	MCS-012	Computer Organization and Assembly Language Programming	4	MCS-022	Operating System Concepts and Networking Management	4
	MCS-013	Discrete Mathematics	2	MCS-023	Introduction to Database Management Systems	3
	MCS-014	Systems Analysis and Design	3	MCS-024	Object Oriented Technologies and Java Programming	3
	MCS-015	Communication Skills	2	MCSL-025	Lab (based on MCS-021, 022, 023 & 024)	4
	MCSL-016	Internet Concepts and Web Design	2			
	MCSL-017	C and Assembly Language Programming Lab	2			
III SEMESTER				**IV SEMESTER**		
II	MCS-031	Design and Analysis of Algorithms	4	MCS-041	Operating Systems	4
	MCS-032	Object Oriented Analysis and Design	3	MCS-042	Data Communication and Computer Networks	4
	MCS-033	Advanced Discrete Mathematics	2	MCS-043	Advanced Database Management Systems	4
	MCS-034	Software Engineering	3	MCS-044	Mini Project	4
	MCS-035	Accountancy and Financial Management	3	MCSL-045	Lab (UNIX & Oracle)	2
	MCSL-036	Lab (based on MCS-032, 034 and 035)	3			
V SEMESTER				**VI SEMESTER**		
III	MCS-051	Advanced Internet Technologies	3	MCSP-060	Project	16
	MCS-052	Principles of Management and Information Systems	2			
	MCS-053	Computer Graphics and Multimedia	4			
	MCSL-054	Lab (based on MCS-051 & 053)	2			
		Elective Courses*				
	MCSE-003	Artificial Intelligence and Knowledge Management	3			
	MCSE-004	Numerical and Statistical Computing	3			
	MCSE-011	Parallel Computing	3			

**** Presently, only 3 elective courses are on offer and a student needs to select all of them. As and when we design the new courses we will inform.***

Total number of Courses are 31

Total number of Credits are 108.

Recognition

IGNOU is a Central University established by an Act of Parliament in 1985 (Act No.50 of 1985) IGNOU Degrees/Diplomas/Certificates are recognized by all member Universities of Association of Indian Universities (AIU) and are at par with Degrees/Diplomas/Certificates of all Indian Universities/Deemed Universities/Institutions vide UGC Circular No. F1-52/2000 (CPP-II) dated 5 May, 2004 & AIU Circular No. EV/B (449)/94/177115 dated January 14, 1994, and UGC's letter no. UGC/DEB/2013 dated 14.10.2013, and UGC notification on UGC website F.No. 1-18/2018 (DEB-I) dated 21-02-2019, list Master of Computer Application

of IGNOU as one the programme recognised from 2018-19 to 2022-23. You may download all the recognition related information from the following web links.

http://www.ignou.ac.in/ignou/aboutignou/division/srd/new
http://ignou.ac.in/ignou/aboutignou/division/srd/Recognition

Completion of BCS-012

Students who took admission into MCA (from July 2013 session onwards), and did not have Mathematics at 10+2 level or at graduate level have to do BCS-012. They are advised to clear it along with the first year of MCA courses. However, all such students have to successfully complete BCS-012 (wherever applicable) before re-registering for MCA 5th semester.

Associate Studentship Scheme

There is a provision of Associate Studentship Scheme in MCA wherein the student can register for a minimum of 8 credits and a maximum of 32 credits. This scheme is permissible for any course(s) of any programme offered by IGNOU, subject to the conditions that the students fulfill the minimum eligibility requirements for the respective programmes, and also undertakes the minimum and maximum credits specified.

Students are not eligible for admission under Associate Studentship Scheme to the course(s) of the programme(s) where clearance of an entrance test is mandatory and also to the programmes where the intake is restricted to a limited number of seats.

Student Support Services

In order to provide individualised support to its learners, the University has created a number of Study Centres throughout the country for this Programme. These are administratively coordinated by the Regional Centres. The Study Centres are the contact points for the students on all major aspects of the Programme. These include counselling sessions, practical sessions, reference library facilities, disseminating information and advice, facilities for audio-visual training aids and teleconferencing.

The University may not always be able to communicate to all the students individually. All the important communications are sent to the Regional Directors who in turn will intimate them to the Study Centre Coordinators. The Coordinators display such Circulars / Notifications on their notice boards for the benefit of the students. You are, therefore, advised to be in touch with your Study Centre Coordinator on a more regular basis so as to get the latest information about assignments, submission schedules (assignments and examination forms), declaration of results, etc.

Newsletter

The IGNOU Newsletter is published twice in a year (April and October) in English and Hindi. This periodical communication is delivered by post to all the students of IGNOU along with course material. Information regarding the examination schedule, new courses to be launched, admissions, telecast schedule, teleconferencing schedule, etc., is also provided through the IGNOU Newsletter.

It covers various activities at IGNOU Headquarters, Regional Centres and Study Centres. It also carries important notifications from time to time.

How to contact the MCA Programme Coordinator?

Students may contact the MCA Programme Coordinator by sending a communication through post to The MCA Programme Coordinator, SOCIS, Vishveswaraiah Bhavan, C-Block, IGNOU Academic Complex, IGNOU, Maidan Garhi, New Delhi – 110068, or can send an Email to mca@ignou.ac.in or by telephone with Tel No: 011-29533436.

2. INSTRUCTIONAL SYSTEM

The methodology of instruction in this University is different from that of the conventional universities. The Open and Distance Learning (ODL) University system is more learner-oriented, and the student has to be an active participant in the teaching-learning process. Most of the instruction is imparted through distance mode with only a small component of face-to-face communication. The University follows a multi-channel approach for instruction. It comprises a suitable mix of:

- ☞ self-instructional printed material
- ☞ audio / video cassettes and CDs
- ☞ audio-video programmes transmitted through AIR and Doordarshan, and at study centre
- ☞ face-to-face counselling at study centres by academic counsellors
- ☞ reference library at study centre
- ☞ web based academic support
- ☞ assignments
- ☞ practical
- ☞ Gyan Darshan Channel, including teleconferencing, Eklavya exclusively for Technology based programmes
- ☞ Gyan Vani.

Print Material

Printed materials are the primary form of instructional materials. These are supplied to the learners in the form of several booklets called blocks. Each block consists of several units. The size of a unit is such that the material given therein may be expected to be studied by a student in a session of about 4 to 6 hours of study. Therefore, you have to concentrate mainly on the print materials, which we send to you. However, the fast pace of computer industry necessitates that students must do some additional readings. Students are advised to study reference books without fail. Studying the printed material alone may not be sufficient to write assignments and prepare for the Term-end Examinations. Some reference books are available at your study centre.

Audio-Video Material and CDs

These are video-cassettes meant for clarification and enhancement of understanding. However, audio / video are supplementary materials and would not be available for all the courses. The audio-video material supplements the print material. Hence, we advise you to make use of it as that

will help you to understand the subject better. However, audio-video material will normally not be supplied to the students individually but will be made available at the Study Centres. You can watch these programmes during counselling sessions. The schedule for screening these films has been synchronised with the progress of relevant written material. Students desirous of buying the audio-video CDs can procure them from:

The Director
EMPC, Sanchar Kendra
IGNOU, Maidan Garhi
New Delhi-110068
Ph. 91-11- 29532163, 29532164, 29533065

The video programmes of SOCIS are also telecast on DD-1(National Channel). The telecast schedule of transmission of programmes is communicated through a monthly booklet called **Gyan Darshan**.

You can contact your Study Centre Coordinator to go through it. You may write to the above-mentioned address for a copy of the same or see the schedule on the IGNOU's website.

Counselling Sessions

The details of the theory and practical counselling sessions are given in the following sections.

Theory Sessions

In distance education, face-to-face contact between the learners and their tutors/counsellors is relatively less. The purpose of such a contact is to answer some of your questions and clarify your doubts that may not be possible through any other means of communication. It also provides you with an opportunity to meet your fellow students.

There are academic counsellors at the Study Centres to provide counselling and guidance to you in the courses that you have chosen for study. Normally, these sessions will be held at the study centres on Saturdays and Sundays.

You should note that the counselling sessions would be very different from the classroom teaching or lectures. Counsellors will not be delivering lectures as in conventional teaching. They will try to help you to overcome difficulties that you face while studying for the MCA programme. In these sessions, you must try to resolve your subject-based difficulties and any other related problems.

Before attending the counselling session for each course, please go through your course material as per the session schedule and make a plan of the points to be discussed. Unless you have gone through the Units, there may not be much to discuss and a counselling session may not be fruitful.

Practical Sessions and Compulsory Attendance

The practical sessions will be held in the computer centres / labs of the Study Centres. In these computer labs, the participants will have the facility to use the computer and software packages relevant to the syllabus. The following points regarding the practical attendance must be noted:

(i) 70% attendance is compulsory for each lab course. **However, this condition is not applicable for the computer time given for a specific assignment.**

(ii) This is a pre-requisite for taking the term-end practical examination in the respective lab courses.

(iii) A student who fails to fulfil the 70% attendance requirements will be allowed to re-register for that lab course. For fee details and the application form, please contact your Regional Centre.

(iv) Students are required to prepare a separate lab record for each lab course. The practical counsellor should duly sign this lab record after each session.

(v) Student attendance will be recorded coursewise at the study centre.

(vi) Strictly follow the guidelines given in the Lab manuals for the respective lab courses.

(vii) Computer to Student ratio will be 1:2.

Counselling Schedule

I SEMESTER						II SEMESTER				
Year	**Course Code**	**Course Title**	**Credits**	**No. of Theory sessions (2 hrs each)**	**No. of Practical sessions (3 hrs each)**	**Course Code**	**Course Title**	**Credits**	**No. of Theory sessions (2 hrs each)**	**No. of Practical sessions (3 hrs each)**
I	MCS-011	Problem Solving and Programming	3	5	2^	MCS-021	Data and File Structures	4	8	
	MCS-012	Computer Organization and Assembly Language Programming	4	8	2^	MCS-022	Operating System Concepts and Networking Management	4	8	2^
	MCS-013	Discrete Mathematics	2	3		MCS-023	Introduction to Database Management Systems	3	5	2^
	MCS-014	Systems Analysis and Design	3	5		MCS-024	Object Oriented Technologies and Java Programming	3	5	2^
	MCS-015	Communication Skills	2	2		MCSL-025	Lab (based on MCS-021, 022, 023 & 024)	4		(10+10+10+10)
	MCSL-016	Internet Concepts and Web Design	2		20					
	MCSL-017	C and Assembly Language Programming Lab	2		(10+10)					
III SEMESTER						**IV SEMESTER**				
II	MCS-031	Design and Analysis of Algorithms	4	8		MCS-041	Operating Systems	4	8	
	MCS-032	Object Oriented Analysis and Design	3	5	2^	MCS-042	Data Communication and Computer Networks	4	8	2^
	MCS-033	Advanced Discrete Mathematics	2	3		MCS-043	Advanced Database Management Systems	4	8	2^
	MCS-034	Software Engineering	3	5		MCS-044	Mini Project	4		10
	MCS-035	Accountancy and Financial Management	3	8		MCSL-045	Lab (UNIX & Oracle)	2		(10+10)
	MCSL-036	Lab (based on MCS-032, 034 and 035)	3		(10+10+10)					

V SEMESTER						VI SEMESTER				
III	MCS-051	Advanced Internet Technologies	3	5	2^	MCSP-060	Project	16	2#	
	MCS-052	Principles of Management and Information Systems	2	3						
	MCS-053	Computer Graphics and Multimedia	4	8	2^					
	MCSL-054	Lab (based on MCS-051 & 053)	2		(10+10)					
		Elective Courses*								
	MCSE-003	Artificial Intelligence and Knowledge Management	3	5						
	MCSE-004	Numerical and Statistical Computing	3	5						
	MCSE-011	Parallel Computing	3	5						

*** Presently, only 3 elective courses are on offer and a student needs to select all of them. As and when we design the new courses we will inform.**

 # These sessions should be conducted in the 5th semester.

^ These sessions are meant for Assignment implementation and attendance is not compulsory.

Semesters and the Number of Sessions:

Semester	No. of Sessions			No. of Hours		
	Theory	Practical	Specific Assignment	Theory	Practical	Specific Assignment
I	23	40	4	46	120	12
II	26	40	6	52	120	18
III	29	30	2	58	60	6
IV	24	30	4	48	90	12
V	31	20	4	62	60	12
VI	2*	-	-	4		
TOTAL	**135**	**160**	**20**	**270**	**480**	**60**

- **These sessions should be conducted in the 5th semester.**

Total Computer time = Practical time + Specific Assignment related time
= 160 Sessions + 20 Sessions
= 480 hours + 60 hours
= 540 hours

Note: 70% attendance is compulsory in Practical Lab Sessions. However, this condition is not applicable for the time given for specific assignment.

Detailed Counselling Schedule for MCA 1st to 6th Semesters

The following is the detailed counselling schedules for 1st to 6th Semesters of MCA. The Schedule is applicable for all the students of MCA 1st year, 2nd year and 3rd year. **The respective study centres will communicate you the exact dates of the Schedule.**

MCA 1st Semester Schedule

MCS-011: Problem Solving and Programming

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	One Session on Block -1 Two sessions each on Block-2 and Block - 3
2.	Practical Sessions	2	These two practical sessions are not compulsory

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1 (Units 1, 2 3 & 4)	Problem Solving, Basics of C, Variables and Constants, Expressions and Operators
	2	Block-2 (Units 5 & 6)	Decision and Loop Control Statements in C and Arrays
	3	Block-2, (Units 7 & 8)	Strings and Functions in C
	4	Block-3, (Units 9 & 10)	Structures & Unions, Pointers
	5	Block-3, Unit 11 & 12	C Preprocessor and Files
Practical Sessions	1&2	Assignment	Design, write and test the MCS-011 assignment problems

MCS-012: Computer Organisation and Assembly Language Programming

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	Two sessions each on each Block
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These are not compulsory.

Session Details

Session Type	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block 1, Unit 1, 2 & 3	von Neumann Architecture, Instruction execution, concept of Interrupts, Fixed point and floating point arithmetic, error detection and other codes, concepts of Gates and Logic Circuits

	2	Block 1, Unit 3 & 4	The Combinational and Sequential circuits, Design of Combinational circuits, examples of combinational circuits, flip flops, sequential circuit design, examples of sequential circuits
	3	Block 2, Unit 1 & 2	The memory hierarchy, Cache, RAM, ROM, DRAM, Flash Memory, secondary storage technologies and Characteristics, RAID and its levels, Cache Organisation, The Memory System of Micro-Computer, Input output interfaces, the concepts of device controllers, Input output techniques, DMA, Device drivers, Input output processors, Interrupt Processing
	4	Block 2, Unit 3 & 4	Hard Drives: Partitioning and Formatting: FAT, Inodes, Drive Speed, Access Time, Rotation Speeds, Hard Drive Interfaces, Removable Storage Options, Video Cards, Liquid Crystal Display (LCD), Modems, Print Resolution, Scanners, Keyboards, Mouse, Power supply
	5	Block 3, Unit 1 & 2	The Instruction format, The Instruction set architecture, The types of Instructions, The types of operands, Addressing modes and their importance, Description of Various types of Registers, Need and importance of registers, The Micro-operation concepts, The Instruction execution and micro-operations
	6	Block 3, Unit 3, 4 &5	The organization of Arithmetic logic unit, The characteristics of ALU, Design of simple units of ALU, Pipelining, The hardwired control, Wilkes control, The Micro-programmed control, the microinstructions, the execution of micro-program, RISC principles, Large Register file in RISC, RISC pipelining
	7	Block 4, Unit 1, 2& 3	8086 microprocessor, The Instruction format, The addressing modes, The types of Instructions, The need and use of assembly language, Input output in assembly Language Program, Sample Assembly Programs including Arrays, Counters, Dealing with various simple statements, Use of various addressing modes
	8	Block 4, Unit 4	Modular Programming, Interfacing assembly with HLL, Device drivers in assembly, Interrupts in assembly
Practical Sessions	1&2	Assignment Problem	Design, write and test the MCS-012 assignment problem

MCS-013: Discrete Mathematics

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	3	One Session on Block -1 Two sessions on Block-2

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1 (Units 1, 2 & 3)	Propositional Calculus, Methods of Proof & Boolean Algebra and Circuits
	2	Block-2 (Units 1,2)	Sets, Relations and Functions & Combinatorics – An Introduction
	3	Block-2 (Units 3, 4)	Some more Counting Principles, Partitions and Distributions

MCS-014: Systems Analysis and Design

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	One Session each on Block -1 and Block-2.Two sessions on Block-3 and one session on Block-4.

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1 (Units 1, 2 3 & 4)	Introduction to Systems Analysis and Design, Profession of a Systems Analyst, Process of Systems Development and Documentation of systems
	2	Block-2 (Units 5,6 &7)	Process of Systems planning, Modular and Structured Design and System Design and Modeling
	3	Block-3 (Units 8 & 9)	Forms and Reports Design, Physical File Design and Database Design
	4	Block-3 (Unit 10)	CASE tools for systems development
	5	Block-4 (Units 11, 12 & 13)	Implementation and Maintenance of systems, Audit and Security of Computer systems, Management Information Systems

MCS-015: Communication Skills

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	2	One Session on Block -1 One session on Block-2

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1 (Units 1 to 5)	Process of Communication, Telephonic Techniques, Job Applications and Interviews, Group Discussions & Managing Organizational Structure
	2	Block-2 (Units 6 to 10)	Meetings, Taking notes and preparing minutes, Presentation Skills I & II and Negotiation skills.

MCSL-016: Internet Concepts and Web Design

Counselling Sessions

Sessions	Number of Sessions	Comments
Practical Sessions	20	Internet Concepts and web design

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Practical Sessions	1	Block -2, Lab Manual (Section -1)	All the problems given in the session - 1, session - 2 and session - 3 of Section -1 of the lab manual are to be executed.
	2	Block -2, Lab Manual (Section - 1)	All the problems given in the session - 4, session - 5 and session - 6 of Section - 1 of the lab manual are to be executed.
	3	Block -2, Lab Manual (Section - 1)	All the problems given in the session - 7 and session - 8 of Section - 1 of the lab manual are to be executed.
	4	Block -2, Lab Manual (Section -1)	All the problems given in the session - 9 and session -10 of Section - 1 of the lab manual are to be executed.
	5	Block -2, Lab Manual (Section - 2)	All the problems given in the session - 1, session - 2 and session - 3 of Section - 2 of the lab manual are to be executed.
	6	Block -2, Lab Manual (Section -2)	All the problems given in the session - 4, session -5 and session-6 of Section - 2 of the lab manual are to be executed.
	7	Block -2, Lab Manual (Section -2)	All the problems given in the session - 7, session - 8 of Section - 2 of the lab manual are to be executed.
	8	Block -2, Lab Manual (Section -2)	All the problems given in the session - 9 and session -10 of Section - 2 of the lab manual are to be executed.
	9	Block -2 ,Lab Manual (Section -3)	All the problems given in the session - 1, session - 2 and session - 3 of Section - 3 of the lab manual are to be executed.
	10	Block -2, Lab Manual (Section -3)	All the problems given in the session - 4, session - 5 and session - 6 of Section - 3 of the lab manual are to be executed.
	11	Block -2, Lab Manual (Section -3)	All the problems given in the session - 7, session - 8 and session - 9 of Section - 3 of the lab manual are to be executed.
	12	Block -2, Lab Manual (Section -3)	All the problems given in the session - 10, session - 11 and session - 12 of Section - 3 of the lab manual are to be executed.
	13	Block -2, Lab Manual (Section -3)	All the problems given in the session - 13, session - 14 and session - 15 of Section - 3 of the lab manual are to be executed.
	14	Block -2, Lab Manual (Section - 4)	All the problems given in the session - 1, session - 2 and session - 3 of Section - 4 of the lab manual are to be executed.
	15	Block -2, Lab Manual (Section - 4)	All the problems given in the session - 4, session -5 and session - 6 of Section - 4 of the lab manual are to be executed.
	16	Block -2, Lab Manual	All the problems given in the session - 7 and session - 8 of Section - 4 of the lab manual are to be executed.

		(Section - 4)	
	17	Block -2, Lab Manual (Section - 4)	All the problems given in the session - 9 and session -10 of Section - 4 of the lab manual are to be executed.
	18	Block -2, Lab Manual (Section -5)	All the problems given in the session - 1, session - 2, session - 3 and session - 4 of Section - 5 of the lab manual are to be executed.
	19	Block -2, Lab Manual (Section -5)	All the problems given in the session - 5, session - 6 and session - 7 of Section - 5 of the lab manual are to be executed.
	20	Block -2, Lab Manual (Section -5)	All the problems given in the session - 8, session - 9 and session -10 of Section - 5 of the lab manual are to be executed.

MCSL-017: C and Assembly Language Programming

Counselling Sessions

Sessions	Number of Sessions	Comments
Practical Sessions	10	Problem Solving and C programming
Practical Sessions	10	Digital Logic Circuits and Assembly Language Programming

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Practical Sessions	1 to 10	Lab Manual (Section -1)	All the problems given in the Section - 1 (session- wise) of the lab manual are to be executed.
	11 to 20	Lab Manual (Section -2 & Section-3)	All the problems given in the Section - 2 and Section - 3 (session- wise) of the lab manual are to be executed.

MCA 2nd Semester Schedule

MCS-021: Data and File Structures

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	Two sessions on each block

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1 and Unit-2
	2	Block-1	All topics of Unit-3
	3	Block-2	All topics of Unit-4 and Unit-5
	4	Block-2	All topics of Unit-6
	5	Block-3	All topics of Unit-7
	6	Block-3	All topics of Unit-8 and Unit-9
	7	Block-4	All topics of Unit-10 and Unit-11
	8	Block-4	All topics of Unit-12

MCS-022: Operating System Concepts and Networking Management

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	Two sessions on each Block
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Session Type	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block 1, Unit 1 and Unit 2	Graphical User Interface and Introduction to Operating System
	2	Block 1, Unit 3 and Unit 4	Introduction to Networking concept and Internetworking: Concept, Architecture and Protocols
	3	Block 2, Unit 1, Unit2 and Unit 3	Introduction to Linux OS, Linux Commands and Utilities, Editor
	4	Block 2, Unit 4 and Unit 5	User to User Communication and Unix System Administration
	5	Block 3, Unit 1 and Unit 2	Windows 2000 Networking and Managing Windows 2000 Server
	6	Block 3, Unit 3 and Unit 4	Advanced Windows 2000 Networking and Windows Xp Networking
	7	Block 4, Unit 1 and Unit 2	Security Concepts and Computer Security
	8	Block 4, Unit 3 and Unit 4	Security and Management
Practical Sessions	1&2	Assignment Problems	Design, Implement and test the MCS-022 assignment problem. These sessions are not compulsory.

MCS-023: Introduction to Database Management Systems

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	Two sessions each on first two Blocks and one session on Block 3 & 4
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Session Type	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block 1: Unit 1 and Unit 2	The Database system, structure of a database, three level Architecture of databases and its importance, the relational model, the entity relationship model, conversion of ER diagrams to Relational Database.

	2	Block 1: Unit 3 and Unit 4	The concepts of integrity, referential integrity, functional dependency, the normal forms till BCNF, sequential file organization, indexes, index and B tree, multi key file organization.
	3	Block 2: Unit 1	The Structured Query Language: data definition and manipulation commands, views, nested queries, examples
	4	Block 2: Unit 2, Unit 3 and Unit 4	Transactions, concurrency related problems and control, locks, two phase locking, deadlock. Database recovery techniques, security and integrity, authorization, data access control, The need and advantages of the distributed and client server database systems, data replication and fragmentation, distributed queries.
	5	Block 3 and Block 4	Discuss the various issues on the case studies of these blocks. Suggest how these studies can be improved.
Practical Sessions	1&2	Assignment Problem	Design, implement and test the MCS 023 assignment problem.

MCS-024: Object Oriented Technologies and Java Programming

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	One Session on Block -1.Three sessions on Block-2 and Block-3 and one session on Block-4
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	Object oriented concepts, JVM, basics of Java, data types, arrays etc.
	2	Block-2	Concept of object, class, inheritance, polymorphism etc.
	3	Block-2, Block-3	Exceptions Handling and Multithreading
	4	Block-3	Different types of I/O operations in java including files handling. String and StringBuffer classes and their methods.
	5	Block-4	Applets programming, GUI components, Layouts and their management, Networking features, Introduction to JDBC, RMI, Java Beans.
Practical Sessions	1&2	Assignment Problem	Design, implement and test the MCS 024 assignment problems.

MCSL-025: Data Structures, Networking, DBMS and Java Programming

Counselling Sessions

Sessions	Number of Sessions	Comments
Practical Sessions	10	Data and File Structures Lab
Practical Sessions	10	Operating System and Networking Lab
Practical Sessions	10	DBMS Lab
Practical Sessions	10	Java Programming Lab

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Practical Sessions	1 to 10	Lab Manual (Section - 1) Data and File Structures Lab Manual	All the problems given in the Section – 1 (session- wise) of the lab manual are to be executed.
	11 to 20	Lab Manual (Section -2) Operating Systems and Networking Lab	All the problems given in the Section – 2 (session- wise) of the lab manual are to be executed.
	21 to 30	Lab Manual (Section -3) DBMS Lab	All the problems given in the Section – 3 (session- wise) of the lab manual are to be executed.
	31 to 40	Lab Manual (Section - 4) Java Programming Lab	All the problems given in the Section – 4 (session- wise) of the lab manual are to be executed.

MCA 3rd Semester Schedule

MCS-031: Design and Analysis of Algorithms

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1
	2	Block-1	All topics of Unit-2
	3	Block-1	All topics of Unit-3
	4	Block-2	All topics of Unit-1 and Unit-2
	5	Block-3	All topics of Unit-1 and Unit-2
	6	Block-3	All topics of Unit-3 and Unit 4
	7	Block-4	All topics of Unit-1
	8	Block-4	All topics of Unit-2 and Unit-3

MCS-032: Object Oriented Analysis and Design

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	Two Session on Block -1.One sessions each on Block-2 and Block-3 and Block-4
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	Unit 1 and Unit 2
	2	Block-1	Unit 3
	3	Block-2	Unit 1, Unit2, and Unit 3
	4	Block-3	Unit 1, Unit2, and Unit 3
	5	Block-4	Unit 1, Unit2, and Unit 3
Practical Sessions	1&2	Assignment Problem	Design different diagrams discussed in MCS032

MCS-033: Advanced Discrete Mathematics

Counselling Sessions

S. No.	Counselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	3	

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	-	Overview of MCS-013
	2	Block-1	All Units
	3	Block-2	All Units

MCS-034: Software Engineering

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	

Session Details

Sessions	Session Number	Block(s) to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1 , Unit-2 and Unit-3
	2	Block-1, 2	All topics of Unit-4 of Block-1 and Units-1,2 of Block-2
	3	Block-2	All topics of Unit-3and Unit-4
	4	Block-3	All topics of Unit-1and Unit-2
	5	Block-3	All topics of Unit-3 and Unit-4

MCS-035: Accountancy and Financial Management

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1 , Unit-2 and Unit-3
	2	Block-1	
	3	Block-2	All topics of Unit-1 and Unit 2 and Unit-3
	4	Block-2	
	5	Block-3	All topics of Unit-1 and Unit-2
	6	Block-3	All topics of Unit-3 and Unit-4
	7	Block-4	All topics of Unit-1 and Unit 2 and Unit-3
	8	Block-4	

MCSL-036: Laboratory Course (For Object Oriented Analysis and Design, Software Engineering and Accountancy and Financial Management)

Counselling Sessions

Sessions	Number of Sessions	Comments
Practical Sessions	10	Object Oriented Analysis and Design Lab
Practical Sessions	10	Software Engineering Lab
Practical Sessions	10	Accountancy and Financial Management Lab

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Practical Sessions	1 to 10	Lab Manual (Section -1) Object Oriented Analysis and Design Lab	All the problems given in the Section – 1 (session- wise) of the lab manual are to be performed in the lab.
	11 to 20	Lab Manual (Section -2) Software Engineering Lab	All the problems given in the Section – 2 (session- wise) of the lab manual are to be performed in the lab.
	21 to 30	Lab Manual (Section -3) Accountancy and Financial Management Lab	All the problems given in the Section – 3 (session- wise) of the lab manual are to be performed in the lab.

MCA 4th Semester Schedule

MCS-041: Operating Systems

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1 and Unit-2
	2	Block-1	All topics of Unit-3 and Unit - 4
	3	Block-2	All topics of Unit-1 and Unit -2
	4	Block-2	All topics of Unit-3
	5	Block-2	All topics of Unit-4
	6	Block-3	All topics of Unit - 1
	7	Block-3	All topics of Unit - 2
	8	Block-3	All topics of Unit - 3 and Unit - 4

MCS-042: Data Communication and Computer Networks

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Session Type	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1 and Unit-2
	2	Block-1	All topics of Unit-3 and Unit-4
	3	Block-2	All topics of Unit-1 and Unit-2
	4	Block-2	All topics of Unit-3 and Unit-4
	5	Block-3	All topics of Unit-1 and Unit-2
	6	Block-3	All topics of Unit-3 and Unit-4
	7	Block-4	All topics of Unit-1 and Unit-2
	8	Block-4	All topics of Unit-3 and Unit-4
Practical Sessions	1&2	Assignment Problems	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

MCS-043: Advanced Database Management Systems

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	
2.	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Session Type	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All topics of Unit-1 and Unit-2
	2	Block-1	All topics of Unit-3 and Unit - 4
	3	Block-2	All topics of Unit-1 and Topics relating to transactions management of Unit –2.
	4	Block-2	All topics of Unit-3 and Unit - 4 and topics relating to recovery in Unit 2.
	5	Block-3	All topics of Unit-1 and Unit - 2
	6	Block-3	All topics of Unit – 3 and Unit - 4
	7	Block-4	All topics of Unit – 1 and Unit -2
	8	Block-4	All topics of Unit - 3 and Unit - 4
Practical Sessions	1&2	Assignment Problems	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

MCS-044: Mini Project

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Practical Sessions	10	

Session Details

Name of the Topic	No. of Practical Sessions (3 hrs each)
Project specification	1
Coding / Implementation	5
Testing	2
Documentation	2

MCSL-045: UNIX and DBMS LAB

Counselling Sessions

Sessions	Number of Sessions	Comments
Practical Sessions	10	UNIX lab
Practical Sessions	10	DMBS Lab

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Practical Sessions	1 to 10	Lab Manual (Section -1) UNIX Lab	All the problems given in the Section – 1 (session- wise) of the lab manual are to be executed.
	11 to 20	Lab Manual (Section -2) DBMS Lab	All the problems given in the Section – 2 (session- wise) of the lab manual are to be executed.

MCA 5th Semester Schedule

MCS-051: Advanced Internet Technologies

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	Two sessions each on Block – 1 and Block – 2 and one session on Block – 3.
2	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All the topics of Unit – 1 and Unit - 2
	2	Block-1	All the topics of Unit – 3 and Unit - 4
	3	Block-2	All the topics of Unit – 1 and Unit - 2
	4	Block-2	All the topics of Unit-3 and Unit - 4
	5	Block - 3	All the topics of Unit –1, 2 and 3
Practical Sessions	1&2	Assignment Problems	To solve MCS-051 assignment problems

MCS-052: Principles of Management and Information Systems

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	3	

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1: Management Systems	All topics of unit 1: Organisational overview and Unit 2: management functions and business processes
	2	Block-1: Management Systems	All topics of unit 3: management systems and Unit 4: business values of information system
		Block-2: Information Management	All topics of unit 1: portfolio management and it applications.
	3	Block-2: Information Management	All topics of unit 2: enterprise resource planning system, unit 3: intelligence information systems and unit 4: social, ethical and legal aspects

MCS-053: Computer Graphics and Multimedia

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	8	
2	Practical Sessions	2	These two practical sessions may be used for solving assignment problems. These sessions are not compulsory.

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All the topics of Unit – 1 Upto Line Drawing Algorithms of Unit -2
	2	Block-1	Rest of the topics of Unit –2 are to be covered All the topics of Unit - 3
	3	Block-2	All the topics of Unit - 1
	4	Block-2	All the topics of Unit-2
	5	Block - 3	All the topics of Unit-1 Upto Depth Buffer method of Unit - 2
	6	Block - 3	Rest of the topics of Unit 2 All the topics upto Shading of Unit 3
	7	Block – 3 Block - 4	Rest of the topics of Unit 3 All the topics upto Simulating Accelerations of Unit -1
	8	Block –4	Rest of the topics of Unit – 1 All the topics of Unit – 2
Practical Sessions	1&2	Assignment Problems	To solve MCS-053 assignment problems

MCSL-054: Laboratory Course
(Advanced Internet Technologies & Computer Graphics and Multimedia)

Counselling Sessions

Sessions	Number of Sessions	Comments
Practical Sessions	10	Advanced Internet Technologies Lab
Practical Sessions	10	Computer Graphics and Multimedia Lab

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Practical Sessions	1 to 10	Lab Manual (Section -1) Advanced Internet Technologies Lab	All the problems given in the Section – 1 (session- wise) of the lab manual are to be executed.

	11 to 20	Lab Manual (Section -2) Computer Graphics and Multimedia	All the problems given in the Section – 2 (session- wise) of the lab manual are to be executed.

MCSE-003: Artificial Intelligence and Knowledge Management

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	Two Units per session

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block -1	All the topics of Unit – 1 and 2
	2	Block - 1 Block - 2	All the topics of Unit – 3 All the topics of Unit -1
	3	Block - 2	All the topics of Unit-2 and Unit-3
	4	Block - 3	All the topics of Unit-1 and Unit-2
	5	Block – 4	All the topics of Unit- 1 and Unit - 2

MCSE-004: Numerical and Statistical Computing

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	One session on Block – 1 and two sessions each on Block – 2 and Block - 3

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All the topics of Unit – 1, 2 and 3
	2	Block-2	All the topics of Unit – 1 Upto Newton's Cotes formulae of Unit-2
	3	Block-2	Rest of the topics of Unit – 2 All the topics of Unit-3
	4	Block-3	All the topics of Unit-1 Upto Inversion Method of Unit-2
	5	Block - 3	Rest of the topics of Unit-2 All the topics of Unit-3

MCSE-011: Parallel Computing

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions	5	Two Units per session

Session Details

Sessions	Session Number	Block to be Covered	Topics to be covered
Theory Counselling	1	Block-1	All the topics of Unit – 1 and Unit - 2
	2	Block-1	All the topics of Unit – 3 and Unit - 4
	3	Block-2	All the topics of Unit-1 and Unit-2
	4	Block-2 Block -3	All the topics of Unit-3 All the topics of Unit - 1
	5	Block - 3	All the topics of Unit-2 and Unit-3

MCA 6th Semester Schedule

MCSP-060: Project

Counselling Sessions

S. No.	Couselling Sessions	Number of Sessions	Comments
1.	Theory Sessions *	2	One session on the project proposal formulation and one session on the project report formulation

Sessions	Session Number	Topics to be covered
Theory Counselling*	1	Detailed discussion on the project proposal formulation
	2	Detailed discussion on the project report formulation

**** These sessions need to be completed during the 5th semester (during Jan-March) of MCA programme as the student needs to submit the project proposal during 1st April to 30th June in the first slot.***

Web Based Support

The learners can have access to IGNOU's website at the following address (URL): ***http://www.ignou.ac.in***.You can download assignments, old question papers, circulars, etc. from the website. The Programme Guide is also available at the website. The following section gives you how to browse the IGNOU's website.

3. BROWSING IGNOU'S WEBSITE

The IGNOU's website is a dynamic source of latest information and is subject to continuous updates. Thus, various pages shown here may change in future. IGNOU itself is continuously changing to bring about improvement in quality of its services. You must visit IGNOU website for all the latest information, filling up or downloading various form, downloading of assignments, results etc.

Navigation from Home Page

The learners can have access to IGNOU's website at the following address (URL) ***http:// www.ignou.ac.in*.** As students get connected to this site, the following page displays the Home Page of IGNOU's web site (Figure 1). Students need to click on various options to get the related information.

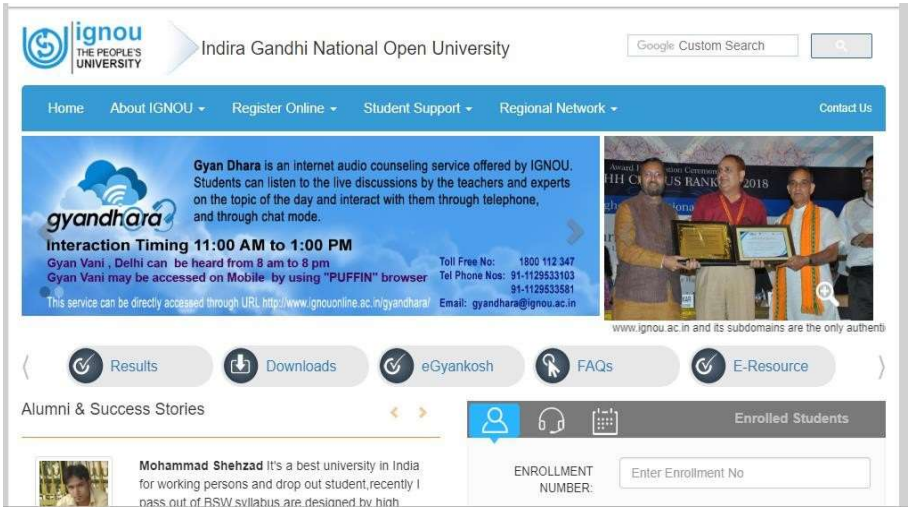

Figure 1: IGNOU Website

From this **Home page** Select **About IGNOU** which will display an Option List select **School of Studies. It** will show you a page of all the Schools of studies of IGNOU, Select **School of Computer and Information Sciecnes (SOCIS)** to display page of SOCIS (Figure 2).School of Computer and Information Sciences (SOCIS) offers PhD in Computer Science, MCA, BCA and CIT programmes, You can click on **Programmes** link on SOCIS page to get the list of programmes on offer as shown in Figure 2. You can now click on MCA programme link to get information about the MCA Programme.

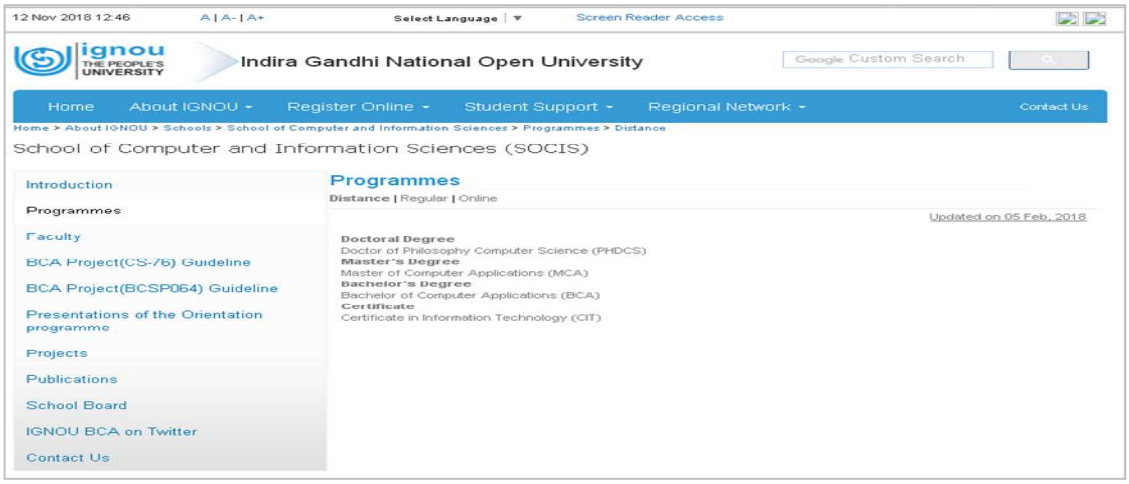

Figure 2: SOCIS Programmes

One of the most important link for students is Student Zone which can be reached from Home page by selecting Student Zone option on the Student Support Option List (Link address: *http://www.ignou.ac.in/ignou/studentzone*). Figure 3 displays the options of the Student Zone page.

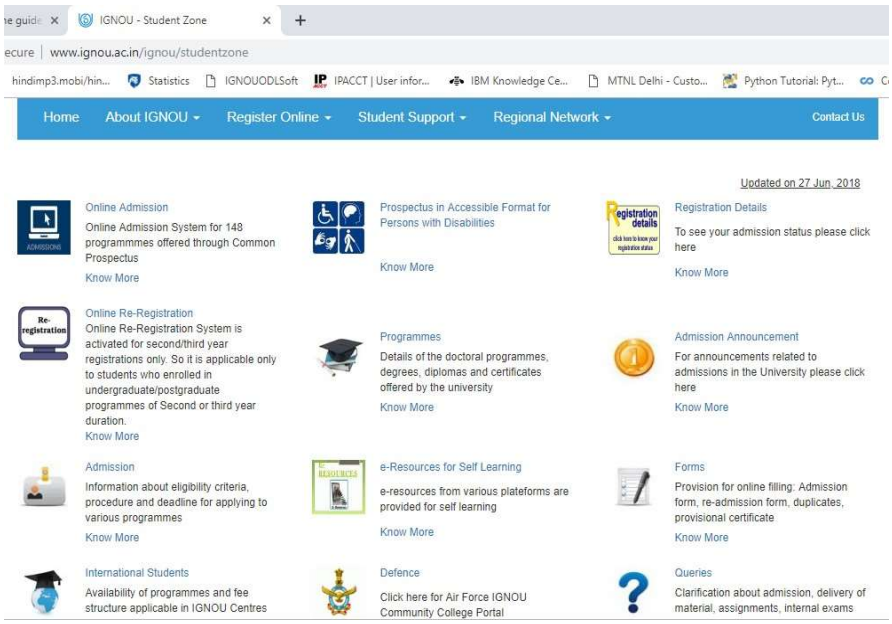

Figure 3: Student Zone page

4. MCA SYLLABUS

The following is the syllabus for the first to fifth semesters of MCA programme. The sixth semester is completely spared for project work.

MCS - 011: Problem-Solving and Programming **3 Credits**

Objectives

The course is aimed to develop problem-solving strategies, techniques and skills that can be applied to computers and problems in other areas which give students an introduction to computer and analytical skills to be used in their subsequent course work and professional development. Emphasis of this course is to act as an introduction to the thinking world of computers, to help students develop the logic, ability to solve the problems efficiently using C programming. Knowledge in a programming language is prerequisite to the study of most of computer science courses. This knowledge area consists of those skills and concepts that are essential to problem-solving and programming practice independent of the underlying paradigm. Student will learn various concepts and techniques for problem-solving and will implement those ideas using C programming.

Syllabus

BLOCK 1: An Introduction to C

Unit 1: Problem Solving

- Problem - Solving Techniques
  - Steps for Problem - Solving
  - Using Computer as a Problem-Solving Tool
- Design of Algorithms
  - Definition
  - Features of Algorithm
  - Criteria to be followed by an Algorithm
  - Top Down Design
- Analysis of Algorithm Efficiency
  - Redundant Computations
  - Referencing Array Elements
  - Inefficiency Due to Late Termination
  - Early Detection of Desired Output Condition
  - Trading Storage for Efficient Gains
- Analysis of Algorithm Complexity
  - Computational Complexity
  - The Order of Notation
  - Rules for using the Big - O Notation
  - Worst and Average Case Behavior
- Flowcharts
  - Basic Symbols used in Flowchart Design

Unit 2: Basics of C

- What is a Program and what is a Programming Language?
- C Language
  - History of C
  - Salient Features of C
- Structure of a C Program
  - A Simple C Program
- Writing a C Program
- Compiling a C Program
  - The C Compiler
  - Syntax and Semantic Errors
- Link and Run the C Program
  - Run the C Program through the Menu
  - Run from an Executable File
  - Linker Errors
  - Logical and Runtime Errors
- Diagrammatic Representation of Program Execution Process

Unit 3: Variables and Constants

- Character Set
- Identifiers and Keywords
  - Rules for Forming Identifiers
  - Keywords
- Data Types and Storage
- Data Type Qualifiers
- Variables
- Declaring Variables
- Initialising Variables
- Constants
  - Integer Constants
  - Floating Point Constants

- Character Constants
- String Constants
- Symbolic Constants

Unit 4: Expressions and Operators

- Assignment Statements
- Arithmetic Operators
- Relational Operators
- Logical Operators
- Comma and Conditional Operators
- Type Cast Operator
- Size of Operator
- C Shorthand
- Priority of Operators

BLOCK 2: Control Statements, Arrays and Functions

Unit 5: Decision and Loop Control Statements

- Decision Control Statements
  - The *if* Statement
  - The *switch* Statement
- Loop Control Statements
  - The *while* Loop
  - The *do-while* Statement
  - The *for* Loop
  - The Nested Loop
- The *Goto* Statement
- The *Break* Statement
- The *Continue* Statement

Unit 6: Arrays

- Array Declaration
  - Syntax of Array Declaration
  - Size Specification
- Array Initialization
  - Initialization of Array Elements in the Declaration
  - Character Array Initialization
- Subscript
- Processing the Arrays
- Multi-Dimensional Arrays
  - Multi-Dimensional Array Declaration
  - Initialization of Two-Dimensional Arrays

Unit 7: Strings

- Declaration and Initialization of Strings
- Display of Strings Using Different Formatting Techniques
- Array of Strings
- Built-in String Functions and Applications
  - *Strlen Function*
  - *Strcpy Function*
  - *Strcmp Function*
  - *Strcat Function*
  - *Strlwr Function*
  - *Strrev Function*
  - *Strspn Function*
- Other String Functions

Unit 8: Functions

- Definition of a Function
- Declaration of a Function
- Function Prototypes
- The Return Statement
- Types of Variables and Storage Classes
  - Automatic Variables
  - External Variables
  - Static Variables
  - Register Variables
- Types of Function Invoking
- Call by Value
- Recursion

BLOCK 3: Structures, Pointers and File Handling

Unit 9: Structures and Unions

- Declaration of Structures
- Accessing the Members of a Structure
- Initializing Structures
- Structures as Function Arguments
- Structures and Arrays
- Unions
- Initializing an Union
- Accessing the Members of an Union

Unit 10: Pointers

- Pointers and their Characteristics
- Address and Indirection Operators
- Pointer Type Declaration and Assignment
  - Pointer to a Pointer
  - Null Pointer Assignment
- Pointer Arithmetic
- Passing Pointers to Functions
  - A Function Returning More than One Value
  - Function Returning a Pointer
- Arrays and Pointers
- Array of Pointers
- Pointers and Strings

Unit 11: The C Preprocessor

- # *define* to Implement Constants

- *# define* to Create Functional Macros
- Reading from Other Files using *# include*
- Conditional Selection of Code using *#ifdef*
  - Using *#ifdef* for different computer types
  - Using *#ifdef* to temporarily remove program statements
- Other Preprocessor Commands
- Predefined Names Defined by Preprocessor
- Macros vs Functions

Unit 12: Files

- File Handling in C Using File Pointers
  - Open a file using the function fopen *( )*
  - Close a file using the function *fclose( )*
- Input and Output using file pointers
  - Character Input and Output in Files
  - String Input / Output Functions
  - Formatted Input / Output Functions
  - Block Input / Output Functions
- Sequential Vs Random Access Files
- Positioning the File Pointer
- The Unbufferred I/O - The UNIX like File Routines

MCS-012: Computer Organisation and Assembly Language Programming 4 Credits

Objectives

In the modern era, computer system is used in most aspects of life. You may use many different types of software on a computer system for particular applications ranging from simple document creation to space data processing. But, how does the Software is executed by the Computer Hardware? The answer to this basic question is contained in this Course. This course presents an overview of the Computer Organisation. After going through this course, you will not only acquire the conceptual framework of Computer Organisation and Architecture but also would be able to use the concepts in the domain of Personal Computers. In specific, you will be able to design Digital Circuits; describe the functions of various components of Computers and their construction; and write simple Assembly Programs.

Structure

BLOCK 1: Introduction to Digital Circuits

Unit 1: The Basic Computer

- The von Neumann Architecture
- Instruction Execution: An Example
- Instruction Cycle
  - Interrupts
  - Interrupts and Instruction Cycle
- Computers: Then and Now
  - The Beginning
  - First Generation Computers
  - Second Generation Computers
  - Third Generation Computers
  - Later Generations

Unit 2: The Data Representation

- Data Representation
- Number Systems
- Decimal Representation in Computers
- Alphanumeric Representation
- Data Representation For Computation
  - Fixed Point Representation
  - Decimal Fixed Point Representation
  - Floating Point Representation
  - Error Detection And Correction Codes

Unit 3: Principles of Logic Circuits I

- Logic Gates
- Logic Circuits
- Combinational Circuits
  - Canonical and Standard Forms
  - Minimization of Gates
- Design of Combinational Circuits
- Examples of Logic Combinational Circuits
  - Adders
  - Decoders
  - Multiplexer
  - Encoder
  - Programmable Logic Array
  - Read Only Memory ROM

Unit 4: Principles of Logic Circuits I

- Sequential Circuits: The Definition
- Flip Flops
  - Basic Flip-Flops
  - Excitation Tables

- Master Slave Flip Flops
- Edge Triggered Flip-flops
- Sequential Circuit Design
- Examples of Sequential Circuits
  - Registers
  - Counters – Asynchronous Counters
  - Synchronous Counters
  - RAM
- Design of a Sample Counter

BLOCK 2: Basic Computer Organisation

Unit 1: The Memory System

- The Memory Hierarchy
- RAM, ROM, DRAM, Flash Memory Secondary Memory and Characteristics Hard Disk Drives
  - Optical Memories
  - CCDs, Bubble Memories
- RAID and its Levels
- The Concepts of High Speed Memories
  - Cache Memory
  - Cache Organisation
  - Memory Interleaving
  - Associative Memory
- Virtual Memory
- The Memory System of Micro-Computer
  - SIMM, DIMM, etc., Memory Chips
  - SDRAM, RDRAM, Cache RAM Types of Memory

Unit 2: The Input/Output System

- Input / Output Devices or External or Peripheral Devices
- The Input Output Interface
- The Device Controllers and its Structure
  - Device Controller
  - Structure of an Input /Output Interface
- Device Drivers
- Input Output Techniques
  - Programmed Input /Output
  - Interrupt-Driven Input /Output
  - Interrupt-Processing
  - DMA (Direct Memory Access)
- Input Output Processors
- External Communication Interfaces

Unit 3: Secondary Storage Techniques

- Secondary Storage Systems
- Hard Drives
  - Characteristics: Drive Speed, Access Time, Rotation Speed
  - Partitioning & Formatting: FAT, Inode
- Drive Cache
  - Hard Drive Interface: IDE, SCSI, EIDE, Ultra DMA & ATA/66
- Removable Drives o Floppy Drives
  - CD-ROM & DVD-ROM
- Removable Storage Options
  - Zip, Jaz & Other Cartridge Drives
  - Recordable CDs & DVDs
  - CD-R vs CD-RW
  - Tape Backup

Unit 4: I/O Technology

- Keyboard
  - Keyboard Layout
  - Keyboard Touch
  - Keyboard Technology
- Mouse
- Video Cards
  - Resolution
  - Colour Depth
  - Video Memory
  - Refresh Rates
  - Graphic Accelerators and 3-D Accelerators
  - Video Card Interfaces
- Monitors
  - Cathode Ray Tubes
  - Shadow Mask
  - Dot Pitch
  - Monitor Resolutions
  - DPI
  - Interlacing
  - Bandwidth
- Liquid Crystal Displays (LCD)
- Digital Camera
- Sound Cards
- Printers
  - Classification of Printers
  - Print Resolutions
  - Print Speed
  - Print Quality
  - Colour Management
- Modems
- Scanners
  - Resolution
  - Dynamic Range/Colour Depth
  - Size and Speed
  - Scanning Tips
- Power Supply SMPS (Switched Mode Power Supply)

BLOCK 3: The Central Processing Unit

Unit 1: Instruction Set Architecture

- Instruction Set Characteristics
- Instruction Set Design Considerations
  - Operand Data Types
  - Types of Instructions
  - Number of Addresses in an Instruction
- Addressing Schemes
  - Immediate Addressing
  - Direct Addressing
  - Indirect Addressing
  - Register Addressing
  - Register Indirect Addressing
  - Indexed Addressing Scheme
  - Base Register Addressing
  - Relative Addressing Scheme
  - Stack Addressing
- Instruction Set and Format Design Issues
  - Instruction Length
  - Allocation of Bits Among Opcode and Operand
  - Variable Length of Instructions
- Example of Instruction Format

Unit 2: Registers, Micro-Operations and Instruction Execution

- Basic CPU Structure
- Register Organization
  - Programmer Visible Registers
  - Status and Control Registers
- General Registers in a Processor
- Micro-operation Concepts
  - Register Transfer Micro-operations
  - Arithmetic Micro-operations
  - Logic Micro-operations
  - Shift Micro-operations
- Instruction Execution and Micro-operations
- Instruction Pipelining

Unit 3: ALU Organisation

- ALU Organisation
  - A Simple ALU Organization
  - A Sample ALU Design
  - Arithmetic Processors

Unit 4: The Control Unit

- The Control Unit
- The Hardwired Control
- Wilkes Control
- The Micro-Programmed Control
- The Micro-Instructions
  - Types of Micro-Instructions
  - Control Memory Organisation
  - Micro-Instruction Formats
- The Execution of Micro-Program

Unit 5: Reduced Instruction Set Computer Architecture

- Introduction to RISC
  - Importance of RISC Processors
  - Reasons for Increased Complexity
  - High Level Language Program Characteristics
- RISC Architecture
- The Use of Large Register File
- Comments on RISC
- RISC Pipelining

BLOCK 4: Assembly Language Programming

Unit 1: Microprocessor Architecture

- Microcomputer Architecture
- Structure of 8086 CPU
  - The Bus Interface Unit
  - Execution Unit (EU)
- Register Set of 8086
- Instruction Set of 8086
  - Data Transfer Instructions
  - Arithmetic Instructions
  - Bit Manipulation Instructions
  - Program Execution Transfer Instructions
  - String Instructions
  - Processor Control Instructions
- Addressing Modes
  - Register Addressing Mode
  - Immediate Addressing Mode
  - Direct Addressing Mode
  - Indirect Addressing Mode

Unit 2: Introduction to Assembly Language Programming

- The Need and Use of the Assembly Language
- Assembly Program Execution
- An Assembly Program and its Components
  - The Program Annotation
  - Directives
- Input Output in Assembly Program
  - Interrupts
  - DOS Function Calls (Using INT 21H)
- The Types of Assembly Programs
  - COM Programs

- EXE Programs
- How to Write Good Assembly Programs

Unit 3: Assembly Language Programming (Part – I)

- Simple Assembly Programs
  - Data Transfer
  - Simple Arithmetic Application
  - Application Using Shift Operations
  - Larger of the Two Numbers
- Programming With Loops and Comparisons
  - Simple Program Loops
  - Find the Largest and the Smallest Array Values
  - Character Coded Data
  - Code Conversion
- Programming for Arithmetic and String Operations
  - String Processing
  - Some More Arithmetic Problems

Unit 4: Assembly Language Programming (Part – I)

- Use of Arrays in Assembly
- Modular Programming
  - The stack
  - FAR and NEAR Procedures
  - Parameter Passing in Procedures
  - External Procedures
- Interfacing Assembly Language Routines to High Level Language
- Programs
  - Simple Interfacing
  - Interfacing Subroutines With Parameter Passing
- Interrupts
- Device Drivers in Assembly

MCS-013: Discrete Mathematics **2 Credits**

Objectives

Discrete mathematics, sometimes called finite mathematics, is the study of mathematical structure that are fundamentally discrete, in the sense of not supporting notion of continuity. A study of discrete sets has become more and more necessary because of many application of computer science and various areas of engineering. In computer science, discrete mathematics are useful to study or express objects or problems in computer algorithm and programming languages. For instance, to improve the efficiency of a computer programs, we need to study its logical structure, which involves a finite number of steps each requiring a certain amount of time. Using the theory of combinatory and graph theory, major areas of discrete mathematics we can do this. Therefore, a study of these areas would complement and improve the understanding of courses based on algorithm and problem solving.

This Course is designed to give basic concepts of Propositions, Predicates, Boolean Algebra, Logic Circuit, Sets, Relations, Functions, Combinatorics, Partitions and Distributions.

Syllabus

BLOCK 1: Elementary Logic

Unit 1: Prepositional Calculus

- Propositions
- Logical Connectives
  - Disjunction
  - Conjunction
  - Negation
  - Conditional Connectives
  - Precedence Rule
- Logical Equivalence
- Logical Quantifiers

Unit 2: Methods of Proof

- What is a Proof?
- Different Methods of Proof
  - Direct Proof
  - Indirect Proofs
  - Counter Examples
- Principle of Induction

Unit 3: Boolean Algebra and Circuits

- Boolean Algebras
- Logic Circuits
- Boolean Functions

BLOCK 2: Basic Combinatorics

Unit 1: Sets, Relations and Functions

- Introducing Sets
- Operations on Sets
  - Basic Operations

- Properties Common to Logic and Sets
- Relations
  - Cartesian Product
  - Relations and their types
  - Properties of Relations
- Functions
  - Types of Functions
  - Operations on Functions

Unit 2: Combinatorics – An Introduction

- Multiplication and Addition Principles
- Permutations
  - Permutations of Objects not Necessarily Distinct
  - Circular Permutations
- Combinations
- Binomial Coefficients
- Combinatorial Probability

Unit 3: Some More Counting Principles

- Pigeonhole Principle
- Inclusion-Exclusion Principle
- Applications of Inclusion – Exclusion
  - Application to Surjective Functions
  - Application to Probability
  - Application to Derangements

Unit 4: Partitions and Distributions

- Integer Partitions
- Distributions
  - Distinguishable Objects into Distinguishable Containers
  - Distinguishable Objects into Indistinguishable Containers
  - Indistinguishable Objects into Distinguishable Containers
  - Indistinguishable Objects into Indistinguishable Containers

MCS-014: Systems Analysis and Design **3 Credits**

Objectives

The objectives of the Course include the enabling of learner to identify the Software projects in an organization after studying various functionalities in the organization. Also, they should be able to structure various requirements, do the design and select the best method to develop the system. They should be able to implement and maintain the system . The learners should also get acquainted with different quality standards as well as learn about Management Information Systems.

Syllabus

BLOCK 1: Introduction to Systems Development

Unit 1: Introduction to SAD

- Fundamentals of System
  - Important Terms related to Systems
  - Classification of Systems
  - Real Life Business Subsystems
- Real Time Systems
- Distributed Systems
- Development of a successful System
- Various Approaches for development of Information Systems
  - Structured Analysis and Design Approach
  - Prototype
  - Joint Application Development

Unit 2: Systems Analyst-A Profession

- Why do Businesses need Systems Analysts?
- Users
- Analysts in various functional areas
  - Systems Analyst in Traditional Business
  - Systems Analyst in Modern Business
- Role of a Systems Analyst
- Duties of a Systems Analyst
- Qualifications of a Systems Analyst
  - Analytical Skills
  - Technical Skills
  - Management Skills
  - Interpersonal Skills

Unit 3: Process of System Development

- Systems Development Life Cycle
- Phases of SDLC
  - Project Identification and Selection
  - Project Initiation and planning
  - Analysis
  - Logical Design

- Physical Design
- Implementation
- Maintenance

- Product of SDLC Phases
- Approaches to Development
  - Prototyping
  - Joint Application Design
  - Participatory Design
- Case Study

Unit 4: Introduction to Documentation of Systems

- Concepts and process of
- Documentation
- Types of Documentation
  - System Requirements Specification
  - System Design Specification
  - Test Design Document
  - User Manual
- Different Standard for Documentation
- Documentation and Quality of Software
- Good Practices for Documentation

BLOCK 2: Planning and Designing Systems

Unit 5 : Process of System Planning

- Fact finding Techniques
  - Interviews
  - Group Discussion
  - Site Visits
  - Presentations
  - Questionnaires
- Issues involved in Feasibility Study
  - Technical Feasibility
  - Operational Feasibility
  - Economic Feasibility
  - Legal Feasibility
- Cost Benefit Analysis
- Preparing Schedule
- Gathering Requirements of System
  - Joint Application Development
  - Prototyping

Unit 6: Modular and Structured Design

- Design Principles
  - Top Down Design
  - Bottom Up Design
- Structure Charts
- Modularity
  - Goals of Design
  - Coupling
  - Cohesion

Unit 7: System Design and Modelling

- Logical and Physical Design
- Process Modeling
  - Data Flow Diagrams
- Data Modeling
  - E-R Diagrams
- Process Specification Tools
  - Decision Tables
  - Decision Trees
  - Notation Structured English
- Data Dictionary

BLOCK 3: More Design Issues and CASE Tools

Unit 8: Forms and Reports Design

- Forms
  - Importance of Forms
- Reports
  - Importance of Reports
- Differences between Forms and Reports
- Process of Designing Forms and Reports
- Deliverables and Outcomes
- Design Specifications
  - Narrative Overviews
  - Sample Design
  - Testing and Usability Assessment
- Types of Information
  - Internal Information
  - External Information
  - Turnaround Document
- General Formatting Guidelines
  - Meaningful Titles
  - Meaningful Information
  - Balanced Layout
  - Easy Navigation
- Guidelines for Displaying Contents
  - Highlight Information
  - Using Colour
  - Displaying Text
  - Designing Tables and Lists
- Criteria for Form Design
  - Organization
  - Consistency
  - Completeness
  - Flexible Entry
  - Economy
- Criteria for Report Design
  - Relevance
  - Accuracy
  - Clarity
  - Timeliness

- Cost

Unit 9: Physical File Design and Data base Design

- Introduction to Database design
  - Flat files vs. Database
  - Steps in Database Design
  - E-R model to Database Design
  - Inputs to Physical Database Design
  - Guidelines for Database Design
- Design of Data Base Fields
  - Types of Fields
  - Rules for Naming Tables and Fields
- Design of Physical Records
- Design of Physical Files
  - Types of Files
  - File Organization
- Design of Database
- Case Study

Unit 10: CASE Tools for Systems Development

- Use of CASE tools by organizations
  - Definition of CASE Tools
  - Use of CASE tools by Organizations
  - Role of CASE Tools
  - Advantages of CASE Tools
  - Disadvantages of CASE Tools
- Components of CASE
  - Types of CASE Tools
  - Classification of CASE Tools
  - Reverse and Forward Engineering
- Visual and Emerging CASE tools
  - Traditional systems development and CASE based systems development
  - CASE environment
  - Emerging CASE Tools
  - Objected oriented CASE tools
  - Creating documentation and reports using CASE tools
  - Creating and executable prototype using Object Oriented CASE tools
  - Sequence Diagrams

BLOCK 4: Implementation and Security of Systems & MIS

Unit 11: Implementation and Maintenance of Systems

- Implementation of Systems
  - Conducting System Tests
  - Preparing Conversion Plan
  - Installing Databases
  - Training the end users
  - Preparation of User Manual
  - Converting to the new System
- Maintenance of Systems
  - Different Maintenance activities
  - Issues involved in Maintenance

Unit 12: Audit and Security of Computer Systems

- Definition of Audit
  - Objectives of Audit
  - Responsibility and Authority of the System Auditor
  - Confidentiality
  - Audit Planning
- Audit of Transactions on Computer
  - Transaction Audit
  - Audit of Computer Security
  - Audit of Application
  - Benefits of Audit
- Computer Assisted Audit Techniques
  - Audit Software
  - Test Data
  - Audit Expert Systems
  - Audit Trail
- Computer System and Security issues
  - Analysis of Threats and Risks
  - Recovering from Disasters
  - Planning the contingencies
  - Viruses
- Concurrent Audit Techniques
  - Need for Concurrent Audit
  - Techniques
  - An Integrated Test Facility
  - Techniques
  - The Snapshot Techniques
  - SCARF
  - Continuous and Intermittent
  - Simulation Technique

Unit 13: Management Information Systems

- Role of MIS in an organization
- Different kinds of Information Systems
  - Transaction Processing System
  - Management Information
  - System
  - Decision Support System
  - Expert System

MCS-015: Communication Skills **2 Credits**

Objectives

This Course is aimed to develop the communication skills at the work place. In this Course, we concentrate on English at the workplace. You are probably wondering whether business English (as it is also called) is a separate language to general English. Certainly not, business English is not a separate language. It is English used at the workplace using specific vocabulary, and in certain situations having a different discourse. Every profession uses a certain 'jargon' and the business context in no different. While business English is firmly rooted in general English, nevertheless there are certain distinguishing features which are evident. In this Course, you will learn some theoretical inputs into the process of communication, its different types, the difference between written and oral communication. We then concentrate on the structure of conversation – its characteristics and conventions, effectively speaking over the telephone, preparing Curriculum Vitae for jobs and interviews, preparing and participating in the Group Discussions, Presentation Skills, Negotiations and many more.

Syllabus

BLOCK 1: Skills Needed at the Work Place - I

Unit 1: The Process of Communication

- Introduction: What is Communication?
- The Process of Communication
- Barriers to Communication
- Different Types of Communication
- Written vs. Oral Communication
- Different Types of Face-to-Face Interactions
- Characteristics and Conventions of Conversation
- Conversational Problems of Second/Foreign Language Users
- Difference between Conversation and Other Speech Events

Unit 2: Telephone Techniques

- Warm Up
- Speaking and Listening: Commonly Used Phrases in Telephone Conversations
- Reading: Conference Calls
- Vocabulary
- Writing and Listening: Leaving a Message
- Grammar and Usage: The Perfect Tenses
- Pronunciation: Contracted Forms

Unit 3: Job Applications and Interviews

- Warm up
- Reading
- Vocabulary: Apply for a Job
- Curriculum Vitae
- Language Focus: Some Useful Words
- Study Skills: Preparing for an Interview
- Listening
- Speaking
- Writing

Unit 4: Group Discussions

- Reading
- Writing Skills
- Listening: How to be Successful in a Group Discussion
- Study Skills
- Language Focus
- Vocabulary
- Speaking
- Grammar: Connectives
- Pronunciation

Unit 5: Managing Organisational Structure

- Warm Up: Ability to Influence and Lead
- Reading: The Role of a Manager
- Vocabulary: Leadership
- Speaking and Listening
- Language Focus: Degree of Probability
- Grammar: Modals
- Writing: Reports
- Pronunciation

Unit 6: Meetings

- Reading: A Successful Meeting
- Speaking: One to One Meetings
- Language Focus: Opening, Middle and Close
- Study Skills: Editing
- Listening: Criteria for Successful Meetings
- Vocabulary
- Grammar: Reporting Verbs
- Writing: Memos

- Pronunciation: Stress According to Part of Speech

Unit 7: Taking Notes and Preparing Minutes

- Taking Notes
  - The Note-taking Skill: The Essential Components
  - The Note-taking Skill: An Example
- Preparing Minutes
  - Format of Minutes
  - Language and Style of Minutes
- Grammar: Using the Passive Voice

Unit 8: Presentation Skills – I

- Reading: Presentation Skills
- Grammar: Verbs often Required in Presentations
- Language Focus
- Listening: Importance of Body Language in Presentations
- Speaking: Preparing an Outline of a Presentation
- Pronunciation

Unit 9: Presentation Skills – II

- Reading: Structure of Presentation
- Study Skills: Visual Aids
- Ending the Presentation
- Language Focus: Talking about Increase and Decrease
- Grammar: Prepositions
- Listening: Podium Panic
- Speaking
- Pronunciation: Emphasizing the Important Words in Context

Unit 10: Negotiation Skills

- Language Focus: Idiomatic Expressions
- Study Skills: Process of Negotiations
- Grammar: Phrasal Verbs
- Listening: Effective Negotiations
- Speaking
- Writing

MCSL-016: Internet Concepts and Web Design (Lab Course) 2 Credits

Objectives

The main objective of the Course is to introduce the whole range of web technologies starting from HTML, DHTML, Java Script, VBScript, and Dreamweaver. It also gives a brief description on Internet. Through various examples, the Course will describe how to design specific page, dynamic web page, forms and frames. It also focuses on the practical aspects of these technologies.

Syllabus

BLOCK 1: Scripting Languages

Unit 1: The Internet

- Classification of Networks
- Networking Models
- What is Packet Switching
- Accessing the Internet
- Internet Protocols
  - Internet Protocol (IP)
  - Transfer Control Protocol (TCP)
- Internet Address
  - Structure of Internet Servers Address
  - Address Space
- How does the Internet work
- Intranet & Extranet
- Internet Infrastructure
- Protocols and Services on Internet
  - Domain Name System
  - SMTP and Electronic Mail
  - HTTP and World Wide Web
  - Usenet and Newgroups
  - FTP
  - Telnet
  - Internet Tools
  - Search Engines
  - Web Browser

Unit 2: Introduction to HTML

- What is HTML
- Basic Tags of HTML
  - HTML Tag
  - TITLE Tag
  - BODY Tag
- Formatting of Text
  - Headers
  - Formatting Tags
  - PRE Tag
  - FONT Tag
  - Special Characters
- Working with Images
- META Tag

Unit 3: Advanced HTML

- Links
  - Anchor tag
- Lists
  - Unordered Lists
  - Ordered Lists
  - Definition Lists
- Tables
  - TABLE, TR and TD Tags
  - Cell Spacing and Cell Padding
  - Colspan and Rowspan
- Frames
  - Frameset
  - FRAME Tag
  - NOFRAMES Tag
- Forms
  - FORM and INPUT Tag
  - Text Box
  - Radio Button
  - Checkbox
  - SELECT Tag and Pull Down Lists
  - Hidden
  - Submit and Reset
- Some Special Tags
  - COLGROUP
  - THREAD, TBODY, TFOOT
  - _blank, _self, _parent, _top
  - IFRAME
  - LABEL
  - Attribute for <SELECT>
  - TEXTAREA

Unit 4: Introduction to JavaScript

- JavaScript Variables and Data Types
  - Declaring Variables
  - Data Types
- Statements and Operators
- Control Structures
  - Conditional Statements
  - Loop Statements
- Object-Based Programming
  - Functions
  - Executing Deferred Scripts
  - Objects
- Message box in Javascript
  - Dialog Boxes
  - Alert Boxes
  - Confirm Boxes
  - Prompt Boxes
- Javascript with HTML
  - Events
  - Event Handlers
- Forms
  - Forms Array

Unit 5: VB Script

- What is VBScript
- Adding VBScript Code to an HTML Page
  - VB Script Basics
  - VBScript Data Types
  - VBScript Variables
  - VBScript Constants
  - VBScript Operators
- Using Conditional Statements
- Looping Through Code
- VBScript Procedures
- VBScript Coding Conventions
- Dictionary Object in VBScript
  - Methods: VBScript Dictionary Object
  - VBScript Dictionary Object Properties
- Err Object
  - Methods: VBScript Err Object
  - Properties: VBScript Err Object

Unit 6: Dreamweaver

- Using Dreamweaver
- Create a Site Home Page
- Design a Page in Layout View
- Insert Images
- Insert Text
- Work in Standard View
- View the Site Files
- Link your Documents

BLOCK 2: Lab Manual

Section 1: HTML (Hypertext Markup Language)

- Basic of HTML
- How to Create HTML Document
- Steps for Creating a Simple HTML Program

Section 2: Advanced HTML

- Advanced Topics of HTML

Section 3: JavaScript

- Script Basics
- Incorporating JavaScript into a Web Page

Section 4: VBScript

- VBScript Basics
- Incorporating VBScript into HTML Page

Section 5: Dreamweaver

- How to Work in Dreamweaver??

- How to save your file?
- Adding Layers to the Timeline and Giving Motion to the Layer
- Inserting Scripts
- Inserting External Media in the Web Page
- Adding SSI(Server-side include to the Page)
- Adding CSS Style to your Page
- Adding XML Files to your Page
- To Export a Dreamweaver Document as XML File, checking entries, working in frames, windows control, the Java script URL.

MCSL -017: Lab (C and Assembly Language Programming) (Lab Course) 2 Credits

Objectives

This lab Course is completely based on MCS-011 and MCS-012 courses. The basic objective of the Course is to provide hands on experience on C Programming and Assembly Language Programming and improve the practical skill. Also to apply all the concepts that have been covered in the theory courses MCS-011 and MCS – 012. The learner will try to apply the alternate ways to provide the solution to a given problem. The learner will be able to develop the logic for the given problem, recognize and understand the syntax and construction of C code, gains experience of C and Assembly Language Programming, know the steps involved in compiling, linking and debugging C code, feel more confident about writing the C functions, including the writing of some complex programs.

Syllabus

Section 1 C Programming Lab

- Salient Features of C
- C Programming Using Borland Compiler
- Using C with UNIX
- Running C Programs using MS Visual C++
- Program Development Life Cycle
- List of Lab Assignments – Session wise

Section 2 Digital Logic Circuits

- Logic Gates Circuit Simulation Program
- Making a Logic Circuit Using Logic
- A Revisit of Steps of Logic Circuit Design
- Session-wise problems

Section 3 Assembly Language Programming

- Assemblers
  - Turbo Assembler (TASM)
  - MASM
  - Emu 8086
  - The DEBUG Program
- Assembly Programming File
- Session-wise List of Programs

MCS-021: Data and File structures 4 Credits

Objectives

The learner should be well versed with the fundamentals of Algorithms, learn various data structures, should be able to use them appropriately as per need during development of programs. Also, the learner should know different sorting and searching techniques so that correct techniques can be used in different programs so that the complexity of the program does not increase due the sorting/search technique employed. The learner should have the knowledge about file structures and finally, s/he should also know the concepts of advanced data structures.

Syllabus

BLOCK 1: Introduction to Algorithms and Data Structures

Unit 1: Analysis of Algorithms

- Mathematical Background
- Process of Analysis
- Calculation of Storage Complexity
- Calculation of Run Time Complexity

Unit 2 Arrays

- Arrays and Pointers
- Sparse Matrices

- Polynomials
- Representation of Arrays
  - Row Major Representation
  - Column Major Representation
- Applications

Unit 3: Lists

- Abstract Data Type-List
- Array Implementation of Lists
- Linked Lists-Implementation
- Doubly Linked Lists-Implementation
- Circularly Linked Lists-Implementation
- Applications

BLOCK 2: Stacks, Queues and Trees

Unit 4: Stacks

- Abstract Data Type-Stack
- Implementation of Stack
  - Implementation of Stack using Arrays
  - Implementation of Stack using Linked Lists
- Algorithmic Implementation of Multiple Stacks
- Applications

Unit 5: Queues

- Abstract Data Type-Queue
- Implementation of Queue
  - Array Implementation
  - Linked List Implementation
- Implementation of Multiple Queues
- Implementation of Circular Queues
  - Array Implementation
  - Linked List Implementation of a circular queue
- Implementation of DEQUEUE
  - Array Implementation of a *dequeue*
  - Linked List Implementation of *a dequeue*

Unit 6: Trees

- Abstract Data Type-Tree
- Implementation of Tree
- Tree Traversals
- Binary Trees
- Implementation of Binary Tree
- Binary Tree Traversals
  - Recursive Implementation of Binary Tree Traversals
  - Non Recursive Implementations of Binary Tree Traversals
- Applications

BLOCK 3: Graph Algorithms and Searching Techniques

Unit 7: Advanced Trees

- Binary Search Trees
  - Traversing a Binary Search Trees
  - Insertion of a node into a Binary Search Tree
  - Deletion of a node from a Binary Search Tree
- AVL Trees
  - Insertion of a node into an AVL Tree
  - Deletion of a node from and AVL Tree
  - AVL tree rotations
  - Applications of AVL Trees
- B-Trees
  - Operations on B-Trees
  - Applications of B-Trees

Unit 8: Graphs

- Definitions
- Shortest Path Algorithms
  - Dijkstra's Algorithm
  - Graphs with Negative Edge costs
  - Acyclic Graphs
  - All Pairs Shortest Paths Algorithm
- Minimum cost Spanning Trees
  - Kruskal's Algorithm
  - Prims's Algorithm
  - Applications
- Breadth First Search
- Depth First Search
- Finding Strongly Connected Components

Unit 9: Searching

- Linear Search
- Binary Search
- Applications

BLOCK 4: File Structures and Advanced Data Structures

Unit 10 Sorting

- Internal Sorting
  - Insertion Sort
  - Bubble Sort
  - Quick Sort
  - 2-way Merge Sot
  - Heap Sort
- Sorting on Several Keys

Unit 11: Advanced Data Structures

- Splay Trees
  - Splaying steps
  - Splaying Algorithm
- Red-Black trees
  - Properties of a Red-Black tree
  - Insertion into a Red-Black tree
  - Deletion from a Red-Black tree
- AA-Trees

Unit 12: File Structures

- Terminology
- File Organisation
- Sequential Files
  - Structure
  - Operations
  - Disadvantages
  - Areas of use
- Direct File Organisation
- Indexed Sequential File Organisation

MCS-022: Operating System Concepts and Networking Management 4 Credits

Objectives

This Course is intended to introduce the concepts, structure, features, trends and design mechanism of Operating System. The Operating System has seen consistent innovations and developments like other fields of computer science. In this Course efforts have been to capture these changes. The trend is towards GUI based free, platform independent, secure and network-based operating system. Linux and Windows 2000 have got very wide coverage in the Course. Security and network management, a part of modern Operating System design, have also been taken up.

Syllabus

BLOCK 1: Operating System Fundamentals Networking

Unit 1: Graphical User Interface

- What is Graphical User Interface
- Evolution of Human and Machine Interaction
- Common Graphical User Interfaces
- Functionality of Graphical User Interface
- GUI Design Consideration: psychological factors
- GUI Design Consideration: standards
- GUI Example
  - Microsoft Windows
  - Macintosh Toolbox
  - X-windows
  - NeXT

Unit 2: Introduction to Operating System

- What is an Operating System?
- Evolution of Operating System
  - Serial Processing
  - Batch Processing
  - Multiprogramming
- Operating System Structure
  - Layered Structure Approach
  - Virtual Machine
  - Client-Server Model
  - Kernel Approach
- Classification of Advanced Operating System
  - Architecture Driven Operating System
  - Application Driven Operating System
- Characteristics of Modern Operating System
  - Microkernel Architecture
  - Multithreading
  - Symmetric Multiprocessing

Unit 3: Introduction to Networking Concepts

- Why Computer Networks
- The Topologies
- Characteristics of the OSI Layers
- OSI Models and Communication between Systems
- Interaction between OSI Model Layers
- Protocols Types of Networks
  - Local Area Network (LANs)
  - Metropolitan Networks (MANs)
  - Wide Area Network (WANs)
- Medium
- Data Flow
- Physical Connection
- Transmission Media
- Connecting Devices
  - Repeaters

- Hubs
- Bridges
- Routers
- Gateways

Unit 4: Internetworking: Concept, Architecture and Protocols

- History of internetworking
- Packet Switching
- Internetworking Concepts
- Internet Addresses Object-Based Programming
- Configuring IP Addresses
- TCP/ IP
- Additional TCP/ IP – Related Protocols
- Application Layer Protocols
  - File Transfer Protocols
  - Trivial File Transfer Protocol (TFTP)
  - TELNET
  - Remote login
  - Electronic Mail (Email)
- World Wide Web
- Domain Name System
- SNMP and UDP

BLOCK 2: Linux Operating System

Unit 1: Introduction to Linux Operating System

- Features of Linux
- Drawbacks of Linux
- Components of Linux
  - Memory Management Subsystems
  - Linux Process and Thread Management
  - File Management System
  - Device Drivers

Unit 2: Linux Commands and Utilities

- Entering the Machine
  - User Names and Groups
  - Logging In
  - Correcting Typing Mistakes
  - Format of Linux Commands
  - Changing Your Password
  - Characters with Special Meanings
  - Linux Documentation
- The File System
  - Current Directory
  - Looking at the Directory Contents
  - Absolute and Relative Pathnames
  - Some Linux Directories and Files

Unit 3: Linux Utilities and Editor

- Some Useful Commands
- Permission Modes and Standard Files
- Pipes, Filters and Redirection
- Shell Scripts
- Graphical User Interface
- Editor

Unit 4: User-to-User Communication

- On-Line Communication
- Off-Line Communication
- Apache Server Settings
- Network Server Settings
  - Domain Name Server
  - Network File Server

Unit 5: Unix System Administration

- System Administration
- Installing Linux
  - Choosing an Installation Method
  - Choosing an Installation Class
  - Pre-installation checks
  - Installation
- Booting the System
- Maintaining User Accounts
- File Systems and Special Files
- Backups and Restoration

BLOCK 3: Windows 2000

Unit 1: Windows 2000 Networking

- Windows 2000 Operating System Architecture
  - Peer-To-Peer Network
  - Domains
  - Network Protocols
  - File Services
  - Shared Folders
  - Distributed File System
  - Print Services
- Using the Mapped Drive
  - Printing a Mapped Drive
  - Disconnecting a Mapped Drive
  - Viewing Directory Information
  - Creating a Shared Folder
  - Logging off a Client
- A Few Important Facts About Windows 2000 Usages

Unit 2: Managing Windows 2000 Server

- Using Windows 2000 and Client
- Logging on to the Network

- Browsing Network Resources
- Accessing Network Resources Using My Network Places
- Mapping a Folder

Unit 3: Advanced Windows 2000 Networking

- Windows 2000 Domains, Workgroups & Trusted Relationships
  - Concept of Domains
  - Trust Relationships
  - Building Domains
- User Administration
- Remote Access

Unit 4: Windows XP Networking

- Introduction to Windows XP Networking
  - TCP/IP Protocol Setting for Windows XP
  - To Select a Network Protocol
  - Virtual Private Networks and Remote Networking
- Windows XP in File System
- Sharing Network Resources in Windows XP
  - Sharing Files in Windows XP
  - Sharing Folders in Windows XP
  - Sharing Drives in Windows XP
- Enabling Offline File Features

BLOCK 4: Security and Management

Unit 1: Security Concepts

- Goals of Computer Security
  - Integrity
  - Confidentiality
  - Availability
- Security Problem and Requirements
  - Identifying the Assets
  - Identifying the Threats
  - Identifying the Impact
- Threat and Vulnerabilities
- User Authentication
- Security System and Facilities
  - System Access Control
  - Password Management
  - Privileged User Management
  - User Account Management
  - Data Resource Protection
  - Sensitive System Protection
- Cryptography
- Intrusion detection
- Computer-Security Classifications

Unit 2: Computer Security

- Hardening Operating System and Application Code
- Hardening File System Security
- Hardening Local Security Policies
- Hardening Services
- Hardening Default Accounts
- Hardening Network Activity
  - Malicious Code
  - Firewall
- Fault Tolerant System
- BACKUP and UPS

Unit 3: Security and Management-I

- Main Issues In Windows Security Management
  - Physical Security Management
  - Logon Security Management
  - Users and Groups Management
  - Managing Local and Global Groups
  - Managing User Accounts
  - Windows NT Domain Management
- Domain Controller
  - The Primary Domain Controller (PDM)
  - Backup Domain Controller (BDC)
- Windows Resources Management
- Registry Management
  - Removing Registry Access
  - Managing Individual Keys
  - Audit Registry Access
- Printer Management
- Managing Windows 2000 Operating System
- Active Directory
  - Logical Structure
  - Physical Structure
- Windows 2000 DNS Management
- Managing Group Policy

Unit 4: Security and Management-II

- User Authentication Management
  - Subsystems Component Management
  - Kerberos Management
- User and Group Management
  - Configuring User Accounts
  - Creating Domain User Accounts
  - Managing Logon Hours
  - Managing Expiry Date for a User Account
  - Windows 2000 Groups Management
  - Default Group Types

- Security Configuration Management Tool
- Resource Management
  - Files and Folder Management
  - Files and Folder Permission
  - Inheritances and Propagation
  - Moving Data and Permission
  - Shared Resources Management
  - The NULL Session
  - Registry Management
  - Default Registry Configurations
  - Registry Backup Managements
  - Printer Security Management
- Windows 2000 Network – Security and Management
  - NAT and ICS
  - RRAS, RADIUS and IAS
  - IPSec
- Encrypting File System Management
  - Encrypting File System (EFS)
  - EFS and Users Management
  - Data Recovery Management
  - EFS Cryptography Management

MCS-023: Introduction to Database Management Systems 3 Credits

Objectives

Database systems are pervasive. They are present in every segment of commercial, academic and virtual world. They are required as the backbone of any information system, enterprise resource planning, research activities and other activity that require permanence of data storage. This Course provides the basic introduction to database system technologies; and concurrency, security and recovery issues of database management systems.

This Course also provides the basic conceptual background necessary to design and develop simple database systems. The major focus in this Course is the relational database model; however, it also discusses about the ER model and distributed databases. This Course enables you to write good queries using a standard query language called SQL.

Syllabus

BLOCK 1: The Database Management System Concepts

Unit 1: The Basic Concepts

- Need for a Database Management System
  - The file based system
  - Limitations of file based system
  - The Database Approach
- The Logical DBMS Architecture
  - Three level architecture of DBMS or logical DBMS architecture
  - Mappings between levels and data independence
  - The need for three level architecture
- Physical DBMS Architecture
  - DML Precompiler
  - DDL Compiler
  - File Manager
  - Database Manager
  - Query Processor
  - Database Administrator
  - Data files indices and Data Dictionary
- Commercial Database Architecture
- Data Models

Unit 2: Relational And ER Models

- The Relational Model
  - Domains, Attributes, Tuple and Relation
  - Super keys Candidate keys and Primary keys for the Relations
- Relational Constraints
  - Domain Constraint
  - Key Constraint
  - Integrity Constraint
  - Update Operations and Dealing with Constraint Violations
- Relational Algebra
  - Basic Set Operation
  - Cartesian Product
  - Relational Operations
- Entity Relationship (ER) Model
  - Entities

- Attributes
- Relationships
- More about Entities and Relationships
- Defining Relationship for College Database

- E-R Diagram
- Conversion of E-R Diagram to Relational Database

Unit 3: Database Integrity and Normalisation

- **Relational Database Integrity**
  - The Keys
  - Referential Integrity
  - Entity Integrity
- **Redundancy and Associated Problems**
- Single-Valued Dependencies
- Single-Valued Normalisation
  - The First Normal Form
  - The Second Normal Form
  - The Third Normal Form
  - Boyce Codd Normal Form
- Desirable Properties of Decomposition
  - Attribute Preservation
  - Lossless-join Decomposition
  - Dependency Preservation
  - Lack of redundancy
- Rules of Data Normalisation
  - Eliminate Repeating Groups
  - Eliminate Redundant Data
  - Eliminate Columns Not Dependent on Key

Unit 4: File Organisation in DBMS

- Physical Database Design Issues
- Storage of Database on Hard Disks
- File Organisation and Its Types
  - Heap files (Unordered files)
  - Sequential File Organisation
  - Indexed (Indexed Sequential) File Organisation
  - Hashed File Organisation
- Types of Indexes
- Index and Tree Structure
- Multi-key File Organisation99
  - Need for Multiple Access Paths
  - Multi-list File Organisation
  - Inverted File Organisation
- Importance of File Organisation in Databases

BLOCK 2: Structured Query Language and Transaction Management

Unit 1: The Structures Query Language

- What is SQL?
- Data Definition Language
- Data Manipulation Language
- Data Control
- Database Objects: Views, Sequences, Indexes and Synonyms
  - Views
  - Sequences
  - Indexes and Synonyms
- Table Handling
- Nested Queries

Unit 2: Transactions and Concurrency Management

- The Transactions
- The Concurrent Transactions
- The Locking Protocol
  - Serialisable Schedules
  - Locks
  - Two Phase Locking (2PL)
- Deadlock and its Prevention
- Optimistic Concurrency Control

Unit 3: Database Recovery and Security

- What is Recovery?
  - Kinds of failures
  - Failure controlling methods
  - Database errors
- Recovery Techniques
- Security & Integrity
  - Relationship between Security and Integrity
  - Difference between Operating System and Database Security
- Authorization

Unit 4: Distributed and Client Server Databases

- Need for Distributed Database Systems
- Structure of Distributed Database
- Advantages and Disadvantages of DDBMS
  - Advantages of Data Distribution
  - Disadvantages of Data Distribution
- Design of Distributed Databases
  - Data Replication
  - Data Fragmentation
- Client Server Databases

- Emergence of Client Server Architecture
- Need for Client Server Computing
- Structure of Client Server Systems
- Advantages of Client Server Systems

BLOCK 3: Application Development: Development of a Hospital Management System

- Need to Develop the Hospital Management System (An HMS)
- Creating a Database for HMS
- Developing Front End Forms
- Reports
- Using Queries and Record set

BLOCK 4: Study Centre Management System: A Case Study

- Software Development Process: Analysis
- System Designing
- Issues relating to Software Development, Testing and Maintenance

MCS-024: Object Oriented Technology and Java Programming **3 Credits**

Objectives

Today almost every branch of computer science is feeling presence of object- orientation. Object oriented technology is successfully incorporated in various fields of computer science. Since its arrival on the scene in 1995, the Java has been accepted as one of the primary programming language.

This Course is designed to give you exposure to basic concepts of object-oriented technology. It will help in learning to write programs in Java using object-oriented paradigm. Approach in this Course is to take Java as a language that is used as a primary tool in many different areas of programming work.

Syllabus

BLOCK 1: Object Oriented Technology and Java

Unit 1: Object Oriented Methodology-1

- Paradigms of Programming Languages
- Evolution of OO Methodology
- Basic Concepts of OO Approach
- Comparison of Object Oriented and Procedure Oriented Approaches
- Benefits of OOPs
- Introduction to Common OO Language
- Applications of OOPs

Unit 2: Object Oriented Methodology-2

- Classes and Objects
- Abstraction and Encapsulation
- Inheritance
- Method Overriding and Polymorphism

Unit 3: Java Language Basics

- Introduction To Java
  - Basic Features
  - Java Virtual Machine Concepts
  - A Simple Java Program
- Primitive Data Type And Variables
  - Java Keywords
  - Integer and Floating Point Data Type
  - Character and Boolean Types
  - Declaring and Initialization Variables
- Java Operators

Unit 4: Expressions, Statements and Arrays

- Expressions
- Statements
- Control Statements
- Selection Statements
- Iterative Statements
- Jump Statements
- Arrays

BLOCK 2: Object Oriented Concepts and Exceptions Handling

Unit 1: Class and Objects

- Class Fundamentals
  - Creating objects
  - Assigning object reference variables
- Introducing Methods
  - Static methods
  - Constructors
- Overloading constructors
  - This Keyword

- Using Objects as Parameters
- Argument passing
- Returning objects

- Method Overloading
- Garbage Collection
- The Finalize ( ) Method

Unit 2: Inheritance and Polymorphism

- Inheritance Basics
- Access Control
- Multilevel Inheritance
- Method Overriding
- Abstract Classes
- Polymorphism
- Final Keyword

Unit 3: Packages and Interfaces

- Package
  - Defining Package
  - CLASSPATH
  - Package naming
- Accessibility of Packages

BLOCK 3: Multithreading, I/O and String Handling

Unit 1: Multithreaded Programming

- Multithreading: An Introduction
- The Main Thread
- Java Thread Model
- Thread Priorities
- Synchronization in Java
- Interthread Communication

Unit 2 : I/O in Java

- I/O Basics
- Streams and Stream Classes
  - Byte Stream Classes
  - Character Stream Classes
- The Predefined Streams
- Reading from, and Writing to, Console
- Reading and Writing Files
- The Transient and Volatile Modifiers
- Using Instance of Native Methods

Unit 3: Strings and Characters

- Fundamentals of Characters and Strings
- The String Class
- String Operations
- Data Conversion using Value Of ( ) Methods
- String Buffer Class and Methods

Unit 4: **Exploring Java I/O**

- Java I/O Classes and Interfaces
- I/O Stream Classes
  - Input and Output Stream
  - Input Stream and Output Stream Hierarchy
- Using Package Members
- Interfaces
- Implementing Interfaces
- Interface and Abstract Classes
- Extends and Implements Together

Unit 4: Exceptions Handling

- Exception
- Handling of Exception
  - Using try-catch
  - Catching Multiple Exceptions
  - Using finally clause
- Types of Exceptions
- Throwing Exceptions
- Writing Exception Subclasses
- Text Streams
- Stream Tokenizer
- Serialization
- Buffered Stream
- Print Stream
- Random Access File

BLOCK 4: Applets Programming and Advance Java Concepts

Unit 1: Applets

- The Applet Class
- Applet Architecture
- An Applet Skeleton: Initialization and Termination
- Handling Events
- HTML Applet Tag

Unit 2: Graphics and User Interfaces

- Graphics Contexts and Graphics Objects
  - Color Control
  - Fonts
  - Coordinate System
- User Interface Components
- Building User Interface with AWT
- Swing-based GUI
- Layouts and Layout Manager
- Container

Unit 3: Networking Features

- Socket Overview
- Reserved Parts and Proxy Servers
- Internet Addressing: Domain
- Naming Services (DNS)
- JAVA and the net: URL

- TCP/IP Sockets
- Datagrams

Unit 4: Advance Java

- Java Database Connectivity
  - Establishing A Connection
  - Transactions with Database
- An Overview of RMI Applications
  - Remote Classes and Interfaces
  - RMI Architecture
  - RMI Object Hierarchy
  - Security
- Java Servlets
  - Servlet Life Cycle
  - Get and Post Methods
  - Session Handling
- Java Beans

MCSL-025: Lab (Data Structures using C, WINDOWS 2000, LINUX / UNIX, Java and MS-ACCESS, My SQL) 4 Credits

Objectives

This Lab Course is based on the courses MCS-021, MCS-022, MCS-023 and MCS-024. It involves the development of the practical skills in Data structures using C programming, Networking, DBMS and Java Programming. Theoretical aspects were already covered in the respective theory courses. This course is an attempt to upgrade and enhance your theoretical skills and provide the hands on experience. By the end of these practical sessions of this Course, you will be able to write programs using basic data structures such as Arrays etc. as well as advanced data structures such as trees etc.

Syllabus

SECTION 1: Data and File Structures Lab Manual

- Arrays
- Structures
- Linked Lists
- Stacks
- Queues
- Trees
- Advanced Trees
- Graphs
- Searching
- Sorting

SECTION 2: Operating Systems and Networking Lab

- Overview of Windows 2000
- Unix and Linux
- Advanced concepts of Local Area Network
- Network administration of Windows 2000
- LINUX administration
- Unix Networking
- Installation and Configuration of the networking services like TCP/IP, DNS, DHCP, FTP, SMTP

SECTION 3: DBMS Lab

- Introduction to MS-Access
- Database Creation
- Use of DBMS Tools/ Client-Server Mode
- Forms and Procedures

SECTION 4: Java Programming Lab

- Programming with Java
- PATH and CLASSPATH Setting
- Example Programs
- List of Lab Assignments

MCS-031: Design and Analysis of Algorithms 4 Credits

Objectives

Algorithm is the central concept of computer science. Whole of computer science can be thought of as revolving around the concept of algorithm - the machines are designed and fabricated to execute algorithms; the programming languages are defined to describe algorithms so that the machines can understand and execute programs written in programming languages; the foundation/theory of Computer Science is the

study of the limits of algorithmic methods, i.e., the study tells whether a particular task is accomplishable by a computer or not, etc.

Hence, the study of the Design and Analysis of Algorithm has to be an essential part of any Computer Science/Engineering curriculum. Even if, software for solving all types of problems may become available in the future and the user/student may not be required to write an algorithm to solve any problem, still training the students in the skills of designing and analyzing the algorithms will remain essential, because these constitute the fundamental skills for solving problems with computers. It is like teaching of geometry to instill in students the skills of logical reasoning.

The objectives of the Course is to make the students aware of and well-groomed in the use of the tools & Techniques of designing and analyzing algorithms.

Syllabus

BLOCK 1 Introduction to Algorithmics

Unit 1: Elementary Algorithmics

- Example of an Algorithm
- Problems and Instances
- Characteristics of an Algorithm
- Problems, Available Tools & Algorithms
- Building Blocks of Algorithms
- Outline of Algorithms

Unit 2: Some pre-rquisites and Asymptotic Bounds

- Some Useful Mathematical Functions & Notations
- Mathematical Expectation
- Principle of Mathematical Induction
- Concept of Efficiency of an Algorithm
- Well Known Asymptotic Functions & Notations

Unit 3: Basics of Analysis

- Analysis of Algorithm ─ Simple Example
- Well Known Sorting Algorithms
- Best-Case and Worst-Case Analyses
- Analysis of Non-Recursive Control Structures
- Recursive Constructs
- Solving Recurrences
- Average-Case & Amortized Analyses

BLOCK 2 Design Techniques-I

Unit 1: Divide-and-Conquer

- General Issues in Divide-And Conquer
- Integer Multiplication
- Binary Search
- Sorting
- Finding the Median
- Matrix Multiplication
- Exponentiation

Unit 2: Graphs Algorithms

- Examples
- Traversing Trees
- Depth-First Search
- Breadth-First Search
- Best-First Search & Minimax Principle
- Topological Sort

BLOCK 3 Design Techniques - II

Unit 1 Dynamic Programming

- The Problem of Making Change
- The Principle of Optimality
- Chained Matrix Multiplication
- Matrix Multiplication Using Dynamic Programming

Unit 2 Greedy Algorithms

- Some Examples
- Formalization of Greedy Technique
- Minimum Spanning Trees
- Prim's Algorithm
- Kruskal's Algorithm

- Dijkstra's Algorithm

Unit 3 Models for Executing Algorithms –I: FA

- Regular Expressions
- Regular Languages
- Finate Automata

Unit 4 Models for Executing Algorithms –II PDFA & CFG

- Formal Language & Grammer
- Context Free Grammer(CFG)
- Pushdown Automata (PDA)

BLOCK 4 Complexity & Completeness

Unit 1: Models for Executing Algorithms – III :TM

- Prelude to Formal Definition
- Turing Machine: Formal Definition and Examples
- Instantaneous Description and Transition Diagram
- Some Formal Definitions
- Observations
- Turing Machine as a Computer of Functions

Unit 2 Algorithmically Unsolvable Problems

- Decidable And Undecidable Problems
- The Halting Problem
- Reduction to Another Undecidable Problem
- Undecidable Problems for CFL
- Other Undecidable Problems

Unit 3 Complexity of Algorithms

- Notations for the Growth Rates of Functions

MCS-032: Object Oriented Analysis and Design **3 Credits**

Objectives

Object oriented analysis and design has emerged as a new paradigm of analysis and design of the systems. This Course is designed to help in learning object oriented analysis and design concepts. This Course is having coverage of UML diagrams and will help in developing understanding in the area of system analysis and design concepts using object-oriented approach. This Course will cover different aspects of OOAD with explaining object modeling dynamic modeling and functional modeling.

Syllabus

BLOCK 1: Object Oriented Modeling and UML

Unit 1: Introduction to Object Oriented Modelling

- Object Oriented Modeling
- Characteristics Object Oriented Modeling
  - Class and Objects
  - Links and Association
  - Generalization and Inheritance
- An Object Model
- Benefits of OO Modeling
- Introduction to OOAD tools

Unit 2: Object Oriented Analysis

- Object Oriented Analysis
- Problem Statement: an Example
- Differences between Structured Analysis and Object Oriented Analysis
- Analysis Techniques
  - Object Modeling
  - Dynamic Modeling
  - Functional Modeling
- Adding Operations
- Analysis Iteration

Unit 3: Using UML

- UML: Introduction
- Object Model Notations:
- Basic Concepts
- Structural Diagrams
  - Class
  - Object
  - Composite
  - Package
  - Component
  - Deployment
- Behavioral Diagrams:
  - Use Case
  - Communication
  - Sequence
  - Interaction Overview

- Activity
- State
- Modeling with Objects

BLOCK 2: Object Oriented Design

Unit 4: System Design

- System Design: An Object Oriented Approach
- Breaking into Subsystems
- Concurrency Identification
- Management of data store
- Controlling events between Objects
- Handling Boundary Conditions

Unit 5: Object Design

- Object Design for Processing
- Object Design Steps
- Designing a Solution
- Choosing Algorithms
- Choosing Data Structures
- Defining Classes and delegation of Responsibilities to Methods

Unit 6: Advance Object Design

- Control and its Implementation
  - Control as a State within Program
  - Control as State Machine Engine
  - Control as Concurrent Task
- Inheritance Adjustment
- Association: Design
- Object Representation
- Design Optimization
- Design Documentation

BLOCK 3: Modeling

Unit 7: Object Modeling

- Advance Modeling Concepts
  - Aggregation
  - Abstract Class
- Multiple Inheritance
- Generalization as an Extension
- Generalization as a Restriction
- Metadata
- Constraints
- An Object Model

Unit 8: Dynamic Modeling

- Events
- State and State Diagram
- Elements of State Diagrams
- Examples of State Diagrams
- Advance Concepts in Dynamic Modeling
- Concurrency
- A Dynamic model

Unit 9: Functional Modeling

- Functional Models
- Data Flow Diagrams
- Features of a DFD
- Design flaws in DFD
- A Functional model
- Relationship between Object, Dynamic, and Functional Models

Block 4: Implementation

Unit 10: Implementation Strategies

- Implementation
  - Using Programming Languages
  - Using Database System
- Unidirectional Implementation
- Bi-directional Implementation
- Implementing associations
- Implementing Constraints
- Implementing Statecharts
- Persistency

Unit 11: Object Mapping with Databases

- Relational Database Schema for Object Modes
- Object Classes to Database Tables
- Mapping Associations to Tables
- Mapping Generalizations to Tables
- Interfacing to Database
- Object Mapping with Databases: an Example

Unit 12: Case Study

- This unit will cover all the OOAD aspects Covered in previous 11(eleven) units of this course.

MCS-033 Advanced Discrete Mathematics **2 credits**

Objectives

This Course assumes the knowledge of the course MCS-013, “Discrete Mathematics”. In the two blocks of this Course, we discuss recursion and graph theory, respectively. The first Block is aimed at developing the

understanding of a very important tool for analyzing recursive programmes, namely, recurrence relations. In the second Block we aim to develop a basic understanding of graph theory, which is a very useful modeling tool for computer programming.

Syllabus

BLOCK 1: Recurrences

Unit 1: Recurrence Relations

- The Fibonacci Sequences, The Tower of Hanoi, Catalan Numbers
- Related Definitions
- Divide and Conquer Methods

Unit 2 Generating Functions

- Definitions and Constructions
- Applications for Finding the Number of Integers Solutions of Linear Equations
- Exponential Generating Functions
- Solving Recurrence Relations using Generating Functions
- Applying Generating Functions for Combinatorial Identities and Partitions

Unit 3 Solving Recurrences

- Linear Homogeneous Recurrences
- Linear Non- Homogeneous Recurrences
- Methods of Inspection, Telescoping Sums, Iteration, Substitution

BLOCK 2: Graph Theory

Unit 1: Basic Properties of Graphs

- What Graphs are
- Degree, Regularity and Isomorphism
- SubGraphs

Unit 2 Connectedness

- Connected Graphs
  - Paths, Circuits and Cycles
  - Components
  - Connectivity
- Bipartite Graphs

Unit 3 Eulerian and Hamiltonian Graphs

- Eulerian Graphs
- Hamiltonian Graphs
- Travelling Salesperson Problem

Unit 4 Graph Colourings

- Vertex Colouring
- Edge Colouring
- Planar Graphs
- Map Colouring Problem

MCS-034: Software Engineering **3 Credits**

Objectives

The objectives of the Course is to make the learner efficiently work as software engineer. S/he should be well acquainted with all the phases of Software Development Life Cycle. The learner should be able to apply the concepts learned for doing research.

Syllabus

BLOCK 1 : Overview of Software Engineering

Unit 1 Software Engineering and its models

- Evolution of Software Engineering
- Software development models
- Capability maturity models
- Software process technology

Unit 2: Principles of Software Requirements Analysis

- Engineering the product
- Modeling the system architecture
- Software prototyping and specification

Unit 3 Software Design

- Data design
- Architectural design
- Interface design
- HCI design
- Modular design

Unit 4 Software testing

- Testing techniques
- Testing for specialized environments
- Debugging

BLOCK 2: Software Project Management

Unit 5: Software Project Planning

- Different types of project metrics
- Software project estimation
- Models for estimation
- Automated tools for estimation

Unit 6: Risk management and Project Scheduling

- Identification of Software risks
- Monitoring of risks
- Management of risks
- Formulating a task set for the project
- Choosing the tasks of software engineering
- Scheduling methods
- The Software project plan

Unit 7 Software Quality Assurance

- Formal technical reviews
- Software reliability
- Software quality standards

Unit 8 Software change management

- Baselines
- Version control
- Change control\
- Auditing and reporting

BLOCK 3: Advanced Software Engineering

Unit 9: Web Software Engineering

- Different layers
- Issues of management of web based projects
- Metrics
- Analysis
- Design
- Testing

Unit 10: Mobile Software Engineering

- Transition from design to coding of mobile applications
- Elements of mobile applications
- Approaches to the development of mobile applications

Unit 11: CASE tools

- Analysis tools
- Design tools
- SQA tools
- UI design tools
- Software testing tools
- Web engineering tools

Unit 12: Advanced Software Engineering

- Clean room Software engineering
- Component based Software engineering
- Re-engineering
- Reverse engineering

MCS-035: Accountancy and Financial Management **3 Credits**

Objectives

This Course aims at introducing the basic accounting procedures and financial management processes. It also focuses on the computerised implementation of the various accounting principles discussed at different levels.

Syllabus

BLOCK 1: Accounting System

Unit 1: Accounting and its Functions

- Scope of Accounting
- Emerging Role of Accounting
- Accounting as an Information System
- Role and Activities of an Accountant
- Accounting Personnel
- Nature of Accounting Function
- Organisation Chart for Accounting and
- Finance

Unit 2: Accounting Concepts and Standards

- Accounting Framework
- Accounting Concepts
- Accounting Standards
- Changing Nature of Generally Accepted
- Accounting Principles (GAAP)
- Attempts towards Standardisation
- Accounting Standards in India

Unit 3: Basic Accounting Process: Preparation of Journal, Ledger and Trial Balance

- Accounting Equation
- Classification of Accounts
- Definitions of Journal and

Ledger
- Journalising Process
- Ledger Posting
- Balancing an Account

- Trial Balance
- Objectives of Preparing Trial Balance
  - Total Method of Preparing the Trial Balance
  - Balance Method of Preparing the Trial Balance
  - Limitations of Trial Balance
- Accounting Cycle

BLOCK 2: Understanding and Analysis of Financial Statements

Unit 1: Preparation and Analysis of Final Accounts

- Trading Account
  - Opening/Closing Stock
  - Net Purchases
  - Direct Expenses
  - Net Sales
- Profit And Loss Account
- Difference between Trading and Profit & Loss Account
- Balance Sheet
- Constructing a Balance Sheet
- Classification of Balance Sheet's Items
- Adjustment Entries
  - Closing Stock
  - Depreciation
  - Bad Debts
  - Provision for Bad and Doubtful Debts
  - Salaries and Wages
  - Outstanding Expenses
  - Prepaid Expenses
  - Accrued Income
  - Income Received in Advance

Unit 2: Funds Flow and Cash Flow Statements

- Statements of changes in Financial Positions
- Fund Flow Statement
- Analysing Changes in Working Capital
- Sources of Funds
- Uses (Applications) of Funds
- Cash Flow Statement
- Sources and Uses of Cash

Unit 3: Ratio Analysis

- Categories of Ratios
  - Long-term Solvency Ratios
  - Short-term Solvency Ratios
  - Activity or Turnover Ratios
  - Profitability Ratios
  - Market Test Ratios

BLOCK 3: Financial Management and Decisions

Unit 1: Introduction to Financial Management

- Evolution of Financial Management
- Significance of Financial Management
- Principles of Financial Management
- Economic Value Added
- Agency Relationship
- Changing Financial Landscape

Unit 2: Time Value of Money and Investment Decisions

- Determining The Future Value
  - Shorter Compounding Period
  - Effective versus Nominal Rates
  - Continuous Compounding
- Annuity

Unit 3: Working Capital Decisions

- Characteristics of Current Assets
- Operating Cycle Concepts
- Factors Influences Working Capital Environment
- Estimating working capital Requirement

BLOCK 4: Working Capital Management

Unit 1: Cash and Treasury Management

- Treasury Management
  - Treasury Risk Management
  - Functions of Treasury Department
- Facets of Cash Management
  - Motives for Holding Cash
  - Cash Planning
  - Determining the Optimum Cash Balance
- Methods of Cash Flow Budgeting
- Investing Surplus Cash
- Cash Collection and Disbursements

Unit 2: Receivables Management

- Terms of Payment
- Credit Policy Variables
- Credit Evaluation
- Monitoring Receivables
- Factoring

Unit 3: Inventory Management

- Reasons for Holding Inventory
- Objectives of Inventory Management
- Techniques of Inventory Control
- Modern Techniques
- Traditional Techniques

MCSL-036 Lab **3 credits**

Objectives

This Course is based on three courses namely MCS-032 (Object Oriented Analysis and Design), MCS-034 (Software Engineering) and MCS-035 (Accountancy and Financial Management). The prime objectives of this Course are (i) To help in learning the use of the computer for object oriented analysis and design concepts, making of UML diagrams with the help of software tools. (ii) to use Software tools for different phases of software development like cycle (iii) to familiarise with the use of software for basic accounting procedures and financial management.

This lab course is based on the courses MCS-032, MCS-034 and MCS-035

MCS-041: Operating Systems **4 Credits**

Objectives

In the second semester student will get exposed to the fundamental concepts of Operating Systems in MCS-022. But that course completely provides knowledge from the implementation, networking and from the practical point of view. This is the core Course on Operating Systems and the main objective of this course is to provide core knowledge of Operating Systems features, functions and techniques. Each and every Operating System function is discussed in detailed. This Course also provides an attempt to throw some light on the advanced topics in O/S like Multiprocessors Systems and Distributed O/S. Case studies of WINDOWS and LINUX are organized at the end of this Course so as to provide the support what ever they had pursued theoretically.

Syllabus

BLOCK 1 Introduction to Operating Systems, Process Management

Unit 1 Operating System-An Overview

- What is an Operating System (OS)?
- Goals of an Operating System
- Generations of Operating Systems
- Types of Operating Systems
- Desirable Qualities of OS
- Operating Systems : Some Examples
- Functions of OS

Unit 2 Processes

- Concept of Process
- System Calls for Process Management
- Process Scheduling
- Scheduling Algorithms
  - First Come First serve (FCFS)
  - Shortest Job First (SJF)
  - Round Robin (RR)
  - Shortest remaining time next (SRTN)
  - Priority Based Scheduling or Event Driven (ED) scheduling
- Performance evaluation of the Scheduling Algorithms

Unit 3: Interprocess Communication and Synchronization

- Interprocess Communication
- Interprocess Synchronization
- Semaphores
- Classical problems in concurrent programming
- Locks
- Monitors and Conditional Variables
- Summary

Unit 4: Deadlocks

- Deadlocks
- Characterization of a Deadlock
- A Resource Allocation Graph
- Dealing with Deadlock Situations
  - Deadlock Prevention
  - Deadlock Avoidance
  - Deadlock Detection and Recovery

- Deadlock detection and recovery
- Deadlock Prevention
  - Havender's Algorithm
- Deadlock Avoidance
  - Banker's Algorithm

BLOCK 2: Memory Management, File Management and Security

Unit 1: Memory Management

- Overlays and Swapping
- Logical and Physical Address Space
- Single Process Monitor
- Contiguous Memory Methods
- Paging
  - Principles of operation
  - Page allocation
  - Hardware Support for Paging
  - Protection and Sharing
- Segmentation
  - Principles of operation
  - Address Translation
  - Protection and Sharing

Unit 2: Virtual Memory

- Virtual Memory
  - Principles of operation
  - Virtual Memory management
  - Protection and sharing
- Demand paging
- Page Replacement policies
- Thrashing
  - Working Set Model
  - Page Fault Rate
- Demand Segmentation
- Combined Systems
  - Segmented paging
  - Paged segmentation

Unit 3: I/O and File Management

- Organization of the I/O function
- I/O Buffering
- Disk Organization
- Disk Scheduling
- RAID
- Disk Cache
- Command language user's view of File System
- The System programmer's view of the file System
- The Operating systems' view of file Management
  - Directories
  - Disk Space Management
  - Disk address translation
  - File related system services
  - Asynchronous Input / Output

Unit 4: Security and Protection

- Security Threats
- Security Policies and Mechanisms
- Authentication
  - Passwords
  - Alternative Forms of Authentication
- Protection in Computer Systems
- Security Models
  - Access-Control Matrix
  - Mandatory Access Control
  - Discretionary Access Control
  - Rule-Based Access Control
  - Role-Based Access Control
  - The Take-grant Model
  - Multilevel Models

BLOCK 3: Advanced Topics and Case Studies

Unit 1: Multiprocessor Systems

- Multiprocessor and Processor Coupling
- Multiprocessor Interconnections
  - Bus-Oriented Systems
  - Crossbar-Connected systems
  - Hypercubes
  - Multistage Switch-based systems
- Types of Multiprocessor Operating System
  - Separate Supervisors
  - Master/Slave
  - Symmetric
- Multiprocessor OS Functions and Requirements
- Multiprocessor Synchronization
  - Test and set
  - Compare and swap
  - Fetch and Add

Unit 2: Distributed Operating Systems

- History ofr Distributed Computing
- Distributed Systems
- Key features and Advantages of a Distributed System
- Design Goals of Distributed Systems
- Design Issues Involved in Distributed Systems
- Distributed System Structure
- Mutual Exclusion in Distributed Systems
- Remote Procedure Calls
- Other Middleware Technologies

Unit 3: Case Study - UNIX

Unit 4: Case Study – WINDOWS 2000

MCS 042: Data Communication and Networks **3 Credits**

Objectives

The main objective of the Course is to deal with fundamental issues of computer network. The Course is designed around the TCP/IP Model. Some of the important topics discussed in the Course are: Data Encoding Techniques, MAC Protocols, Routing Techniques, Transport Services, Mechanism and Network Security.

Syllabus

BLOCK 1: Introduction to Data Communication and Computer Network Concepts

Unit 1: Introduction to Computer Networks

- What is computer Network
- Network Goals / Motivation
- Application of Networks
- Point to Point or Switched Networks
  - Circuit Switched Networks
  - Packet-Switched Networks
- Broadcast Networks
  - Packet Radio Networks
  - Satellite Networks
  - Local Area Networks
- Network Protocols
- Networking Model
- Examples of Some Networks

Unit 2: Data Transmission

- Transmission Terminology
  - Simplex, Half duplex & full duplex spectrum and Bandwidth, frequency
- Serial & Parallel Communication
- Analog and Digital Data Transmission
- Bandwidth & Date Rate Throughout
- Transmission Impairments
  - Attenuation and Distortion
  - Delay Distortion
  - Noise
  - Concept of Delays
  - How to reduce delays
- Transmission Media and its Characteristics
  - Twisted Pair
  - IBM Cable
  - Coaxial Cable
  - Twin Axial Cable
  - Optical Fiber
  - Terrestrial Microwave
  - Satellite Microwave
- Wireless Transmission
  - Radio
  - Infra red
  - Wireless LAN

Unit 3: Data Encoding & Communication Technique

- Pulse Code Modulation (PCM)
- Amplitude Modulation
- Frequency and Phase Modulation
- Asynchronous Transmission
- Synchronous Transmission

Unit 4: Multiplexing and Switching

- Frequency Division Multiplexing
- Synchronous Time Division Multiplexing
- Statistical Time Division Multiplexing
- Modems
- Switching

BLOCK 2: Media Access Control and Data Link Layer

Unit 1: Data Link Layer Fundamentals

- Framing
- Basics of Error Detection
- Forward Error Correction
- Cyclic Redundancy Check codes for Error Detection
- Flow Control

Unit 2: Retransmission Strategies

- Stop-&-Wait ARQ
- Go-Back-NARQ
- Selective Repeat ARQ
- Pipelining

Unit 3: Contention-based Media Access Protocols

- The advantages of Multiple-Access Sharing of Channel Resource
- Pure ALOHA
- Slotted ALOHA

- Carrier Sense Multiple Access (CSMA)
- CSMA with Collision Detection (CSMA/CD)

Unit 4: Polling-based Media Access Control Protocols

- Token Ring
- Token Bus

Unit 5: Media Access Control Protocols for High Speed Networks

- FDDI-I and FDDI-H
- DQDB with Bandwidth Balancing for Fair Access
- Asynchronous Transfer Mode (ATM)

BLOCK 3: Network Layer

Unit 1: Introduction to Layer Functionality and Design Issues

- Connection Oriented Vs Connectionless Services
- Addressing
- Concept of Congestion
- Routing
- Network Layer in ATM Protocols
- Network Layer Design Issues

Unit 2: Routing Algorithms

- Shortest Path Routing
- Flooding
- Distance Vector Routing
- Link State Routing
- Hierarchical Routing
- Broadcast Routing
- Multicast Routing

Unit 3: Congestion Control Algorithms

- General Principles of Congestion Control
- Congestion Prevention Policies
- Congestion Control in Virtual Circuit Subnets
- Load Shedding
- Jitter Control

Unit 4: Internetworking & Network Layer in the Internet

- Tunneling
- Internetworking Routing
- Fragmentation
- IP Protocol
- IP Addresses
- Internet Control Protocols
- OSPF – The Interior Gateway Routing Protocol
- BGP – The Exterior Gateway Routing Protocol
- Internet Multicasting
- Mobile IP
- IPv6

BLOCK 4: Transport Layer and Application Layer Services

Unit 1: Transport Services and Mechanism

- Type of Services
- Quality of Services
- Data Transfer
- Connection Management Transport Control Mechanism
- Addressing
- Multiplexing
- Flow Control and Buffering
- Connection Establishment
- Crash Recovery

Unit 2: TCP/UDP

- Introduction to UDP
- Remote procedure Call
- The Real-Time Transport Protocol
- Introduction to TCP
- TCP Service Model
- TCP Protocol
- TCP Segment Header
- TCP Connection Establishment
- TCP Connection Release
- Modeling TCP Connection Management
- TCP Transmission Policy
- TCP Congestion Control
- TCP Timer Management

Unit 3: Network Security I

- Cryptography
- Symmetric Key Algorithms
- Public Key Algorithms

Unit 4: Network Security II

- Digital Signatures
- Management of Public Keys
- Communication Security
- Web Security

MCS 043: Advanced Database Management Systems **4 Credits**

Objectives

This Course will help the students to acquire the theoretical foundation of Database Management Systems. It includes concepts relating to various advanced database models, and concepts like database mining and warehousing. This Course also describes in major details about the advanced concepts of relation database management systems. Additionally, the Course also provides sample database management system architecture. Thus, this is an advanced course, which will further develop the knowledge and skill acquired by the students at the basic level.

Structure

BLOCK 1: Database Design and Implementation

Unit 1: Relational Database Design

- Features of good database design
- Enhanced ER tools
  - Subclasses, Super class, and Inheritance
  - Specialization and Generalization
  - Constraints and Characteristics of Specialization and Generalization
- Converting EER diagram to tables
- Functional dependency theory and normalization
- Multi value dependency and 4NF
- Join Dependency and 5NF
- Inclusion Dependencies and Template Dependency
- PJNF/DKNF
- Modeling temporal data

Unit 2: Database implementation and Tools

- Information system and organization
- Data Design and Implementation in an Organization
- Use of UML and its support for database design specifications
- Representing specialization and generalization in UML Class diagram.
- UML based design tools
- Automated database design tools.

Unit 3: Advanced SQL

- Assertion and views
- Cursors, triggers and stored procedures
- Embedded SQL, dynamic SQL, SQLJ,
- Advanced Features of SQL
- Examples of above in Oracle

Unit 4: Database System Catalog

- Catalogs for relational DBMS
- System Catalog in Oracle
- Data dictionary and data repository system
- Catalog in Distributed database and object oriented database systems
- Role of system catalog in administration

BLOCK 2: DBMS Advanced Features and Distributed Database

Unit 1: Query Processing and Evaluation

- Measures of Query Cost
  - Selection Operation,
  - Sorting
  - Join Operation
  - other Operations
- Evaluation of Expression
- Transformation of Relational Expressions
- Role of Relational Algebra and Relational Calculus in query optimisation
- Estimating Statistics of Expression
- Choice of Evaluation Plans
- Views and query processing
- Storage and query optimization

Unit 2: Transaction Management and Recovery

- Advanced feature of Transactions
- Enhanced Lock Based and timestamp based Protocols
- Multiple Granularity
- Multi-version Schemes
- Deadlock Handling
- Weak Levels of Consistency
- Concurrency in Index Structures
- Recovery and Atomicity
- Recovery with Concurrent Transaction

- Buffer Management
- Advanced Recovery Techniques
- Remote Backup Systems
- Use of SQL in recovery
- Examples of e-transactions

Unit 3: Database Security and Authorization

- Levels of database security
- Access control
- Multilevel security
- Statistical database security
- Audit trails in the databases
- Examples of e security

Unit 4: Distributed Databases

- Centralised versus non centralized Databases
- Homogeneous and Heterogeneous DDBMS and their comparison
- Functions and Architecture
- Distributed database design, query processing in DDBMS
- Distributed concurrency management, deadlock management
- Distributed Commit Protocols: 2 PC and 3 PC
- Concepts of replication servers

BLOCK 3: ENHANCED DATABASE MODELS

Unit 1: Object Oriented Database

- Limitations of Relational databases
- The need of Object oriented databases
- Complex Data Types
- Structured Types and Inheritance in SQL
- Table Inheritance
- Data types (arrays, multi-set etc) and structure in Object oriented databases using SQL
- Object-Identity and Reference Types in SQL
- ODL and OQL
- Implementing O-R Features
- Persistent Programming Languages
- Object-Oriented versus Object-Relational
- An Example of Object oriented and object relational database implementation

Unit 2: Database and XML

- Structured Semi structure and unstructured data
- XML hierarchical tree data model
- Documents DTD and XML schema
- XML Documents & Database
- XML query and tranasformation
- Storage of XML data
- XML database applications

Unit 3: Introduction to data warehousing

- What is Data Warehousing, DSS and EIS?
- Characteristics and functioning and architecture of Data Warehousing
- Data marts
- Data warehousing Life Cycle
- Data modeling (Multidimensional Database) for data warehousing
- Building of data warehouse
- OLAP, MOLAP, ROLAP
- Data warehouse and views
- Future open issue for data warehouse

Unit 4: Introduction to Data Mining

- What is data mining Technology and its relationship to Data warehousing
- Association rules
- Classification
- Clustering
- Approaches to data mining problems
- Applications of Data mining problem
- Commercial tools of data mining
- Knowledge Discovery

BLOCK 4: Emerging Trends and Example DBMS Architectures

Unit 1: Emerging Database Models, Technologies and Applications I

- Multimedia database
- Geography databases, Gnome databases
- Knowledge databases, deductive databases and semantic databases
- Spatial database
- Information visualization

Unit 2: Emerging Database Models, Technologies and Applications II

- Mobile databases
- Web databases (JDBC, ODBC)
- Personal databases
- Digital libraries
- Data grids

- Wireless networks and databases

Unit 3: PostgreSQL

- Important features and brief architecture
- User Interfaces
- SQL Variations and Extensions
- Transaction Management
- Storage and Indexing
- Query Processing and evaluation and optimization

Unit 4: Oracle

- Features and basic architecture
- Database Design and Querying Tools
- SQL Variations and Extensions
- Storage and Indexing
- Query Processing, evaluation and Optimization
- Concurrency Control and Recovery
- Distributed Oracle
- Database administration and other advanced tools

MCS - 044: Mini Project **4 Credits**

Objectives

The project work constitutes a major component in most of the professional programmes and it is to be carried out with due care and should be executed with seriousness by the students. The objective of the project is to motivate them to work in emerging/ latest technologies, help the student to develop ability to apply theoretical and practical tools/techniques to solve real life problems related to industry, academic institutions and research laboratories. This project will help the student make ease and provide enough experience to carry out the larger project in the sixth semester. You will receive a block containing the guidelines for the mini project along with the list of project specifications, category-wise.

MCSL-045 Lab (UNIX & DBMS) **2 Credits**

Objectives

This lab Course is based on MCS-041(Operating Systems) and MCS-043(Advanced Database Management Systems) courses. The basic objective of the Course is to provide the hands on experience to improve the practical skills on UNIX Operating System and Oracle DBMS and also to apply the concepts that been covered in the courses MCS-041 and MCS – 043. This Course is divided into 2 Sections: Section – 1 covers the Unix Lab and Section – 2 covers the DBMS Lab. At the end of each Section, lists of exercises are given for your practice.

MCS-051: Advanced Internet Technologies **3 Credits**

Objectives

The Major Objectives of the Course is to introduce concepts, tools/technologies and programming to rapidly develop Internet based distributed, secure, reliable and scalable application. The discussion in the course is centered around Servelet and JSP (Java Server Pages) Programming, JDBC APIs, Server Side component architecture (Enterprise Java Beans), and XML. It also introduces Web Security and its implementation.

Syllabus

BLOCK 1: Servelet and JSP Programming

Unit 1: Introduction to Servelet

- Servelet life Cycle
- HTTP Servelet Class
- Request Interface
- Response Interface
- Session Tracking (Cookies VRL)
- Database Connectivity from Servelet
- Interservelet Communication
- Handling Servelet
- Servelet Collaboration

Unit 2: Database Connection

- JDBC Drivers
- JDBC APIs
- JDBC Techniques
- Statements & its Types
- Record Sets

- Various Operations (Insertion, Deletion & updation)

Unit 3: JSP-I

- Overview of JSP
- Relation of Applets and Servelets with JSP
- Scripting Elements
- JSP Expressions
- JSP Scriplets
- JSP Declarations
- Predefined Variables
- Creating Custom JSP Tag Libraries Using Nested Tags

Unit 4: JSP-II

- Structuring Generated Servelet in JSP Pages
- Including Files and Applets in JSP Documents
- Integrating Servelet and JSP

BLOCK 2: EJB and XML

Unit 1: Introduction to Beans

- Types of Beans
- Session Beans
- Counting Beans
- Message Beans
- Context and Naming Convention

Unit 2: Creating Beans

- How to Create Beans
- Create Web Application
- Create Application Client

Unit 3: Deploying Beans

- Deploying J2EE Applications

Unit 4: XML

- Overview of XML
- Overview of SGML
- Differentiate Between SGML and XML
- XML Development Goal
- Structure of XML Document
- Using DTD
- XML Parser
- Using XML Introduction
- XML Entities

BLOCK 3: Web Security and Case Study

Unit 1: Web Security Concepts

- HTTP Authentication
- Compare and Contrast
- Application Types (BASIC, DIGEST, FORM and Client CERT)

Unit 2: Security Implementation

- Retrieving Authentication Information
- Security in Servelet
- Form Based Custom Authorisation
- Retrieving SSL Authentication

Unit 3: Case Study

MCS-052: Principles of Management and Information Systems **2 Credits**

Objectives

The Course objective is to provide the use and function of management information systems. It describes and evaluates information systems development processes and techniques.

Syllabus

BLOCK 1: Management Systems

Unit 1: Organisational Overview

- Oraganisation Types
  - Service, Business, Government, Social
  - Industry Types
- Organisational Structure
- Organisational Characteristics
  - Size
  - Location
  - Others
- Organisation functions
- Life cycle of organisation
- Vertical and horizontal organisations

Unit 2:Management Functions and Business Processes

- Overview of management Levels
- Business Processes
  - Sale and orders
  - Finance

- Human resource
- Production
- Marketing

- Information systems requirements
- Requirement analysis
- Tools and methods for requirement analysis

Unit 3:Management Systems

- Management Systems Types
- Management Systems Requirements
- Levels of management activities
- Strategic level
- Management level
- Middle Management Level

Unit 4: Business values of Information System

- Impact of Information Systems
- Empirical studies
- Cost Value Performance
- Total cost of ownership
- Culture for Information Systems
- Decision management with Information Systems

BLOCK 2: Information Systems

Unit 5: Portfolio Management and IT applications

- What is portfolio management
- Portfolio management methods
- Design and implementation of portfolio management
- Risk Management
- Disaster Management
- Portfolio management issues and challenges
- Tools and techniques
- Emerging technologies

Unit 6: Enterprise Information Systems

- Evolution of enterprise information Systems
- Enterprise Resource Planning
- Resource planning management
- ERP Market
- Supply Chain Management
- Customer Relationship Management
- E-CRM Systems
- Emerging technologies

Unit 7: Intelligence Information Systems

- Knowledge Management in organization
- Creating, developing & sharing Knowledge
- Artificial intelligence in business
- Business Analytics
- Business Intelligence
- Role of Business Intelligence
  - Sale and orders
  - Finance
  - Human resource
  - Marketing
- Business Intelligence Tools
- Business Intelligence reports

Unit 8: Social, Ethical and Legal Aspects

- Society in information age
- Moral dimensions and information age
- Technology trends and ethical issues
- Ethical principal and dilemma
- Responsibility, accountability and liability
- Information right and acts

MCS-053 Computer Graphics and Multimedia **4 Credits**

Objectives

The Aim & Objective of the Course is to enable the learner's thinking process in the field of Computer Graphics, Animation, Simulation and Multimedia. After going through the Course the learner will be able to understand the abilities required to develop the graphical tools. The understanding of the learned concepts will help the learner in executing the practical component i.e. Lab component of the Computer Graphics

Syllabus

BLOCK 1: Raster Graphics and Clipping

Unit 1: Introduction to Computer Graphics

- What is Computer Graphics?
- Application of Computer Graphics
  - Presentation Graphics
  - Painting and Drawing
  - Photo Editing
  - Scientific Visualization
  - Image Processing
  - Digital Art
  - Education, training, Entertainment and CAD
  - Simulation
  - Animation and Games
- Graphics Hardware
- Input and Output Devices
  - Touch Panel
  - Light Pens
  - Graphic Tablets
  - Plotters
  - Film Recorders
- Display Devices
- Refreshing Display Devices
  - Raster-Scan
  - Random-Scan
- Plasma Panel and LCD panels

Unit 2: Graphics Primitives

- Points and Lines
- Line-drawing Algorithms
  - DDA Algorithm
  - Bresenham's line Algorithm
- Circle-generating Algorithm
  - Properties of Circles
  - Midpoint Circle of Algorithm
- Polygon Filling Algorithm: Scan-Line

Unit 3: 2-D Viewing and Clipping

- Point Clipping
- Line Clipping
  - Cohen-Sutherland Line Clippings
  - Cyrus-Beck Line Clipping Algorithm
- **Polygon Clipping: Sutherland Hodgman Algorithm**
- Windowing Transformation

BLOCK 2: Transformations

Unit 4: 2-D and 3-D Transformations

- Basic Transformations
  - Translation
  - Rotation
  - Scaling
  - Shear
- **Composite Transformations**
  - Rotations about a point
  - Reflection about a line
- Homogeneous Coordinate Systems
- 3-D Transformations

Unit 5: Viewing Transformation

- Projections
  - Parallel Projection
  - Orthographic & Oblique Projections
  - Isometric Projections
- Perspective Projections

BLOCK 3: Modeling & Rendering

Unit 6: Curves and Surfaces

- Polygon Representation Methods
  - Polygon Surfaces
  - Polygon Tables
  - Plane Equations
  - Polygon Meshes
- Bezier Curves and Surfaces
  - Bezier Curves
  - Properties of Bezier Curves
  - Bezier Surfaces
- Surface of Revolution

Unit 7: Visible – Surface Detection

- Depth Buffer Method
- Scan-Line Method
- Area-Subdivision Method

Unit 8: Polygon Rendering and Ray Tracing Methods

- Illumination Model
  - Ambient Reflection
  - Diffuse Reflection
  - Specular Reflection
- Shading
  - Gouraud Shading
  - Phong Shading
- Ray Tracing
  - Basic Ray-Tracing Algorithm

BLOCK 4: Multimedia and Animation

Unit 9: Computer Animation

- Basic of Animation
- Types of Animation
- Simulating Accelerations
- Computer Animation Tools
- Applications

Unit 10: Multimedia Concepts and Applications

- Concepts of Hypertext/Hypermedia
- Multimedia Applications
  - Education
  - Video Conferencing
  - Training
  - Entertainment
  - Electronic Encyclopedia
- Images
- Audio and Video
  - Analog and Digital Sound and Video
  - Mpeg, mpi, wav, etc.
- Multimedia Tools

MCSL-054 Lab (Advanced Internet Technologies and Computer Graphics) 2 Credits

MCSE-003 Artificial Intelligence and Knowledge Management 3 Credits

Objectives

One of the ways of looking at Artificial Intelligence (AI) is as the study concerned with solving hard and insolvable problems using reasonable amount of time, by exploiting the knowledge of the problem domain. In view of the significance of knowledge in AI, in this course, a number of knowledge representation formalisms are introduced. The formalisms discussed include Propositional Logic, First Order Predicate Logic, Rule-based systems, Semantic Networks and Frames. In order to encode knowledge structures obtained using these formalisms, the syntax of each of the two well-known AI programming languages LISP and PROLOG is discussed along with explanation of how the language can be to encode proposed solutions. Finally, as applications/ products of AI, the topics on Expert Systems and Intelligent Agents are discussed briefly.

MCSE-003 is a 4-credit course and the course material consists of 4 blocks. The pre-requisites for the course include Design and Analysis of Algorithms, Discrete Mathematics and programming and problem solving experience.

Syllabus

BLOCK 1: Problem Solving & Search Techniques

Unit 1: Introduction

- Concepts & definitions of AI
- Brief history of AI
- AI and related fields
- Problems
- Techniques
- Characteristics and underlying assumption of AI
- Turing test Uninformed searches
- Informed searches: generate and test
- Hill-climbing
- best-first search

Unit 2: State Space Representation & Search Techniques

- A* algorithm
- Problem reduction
- Constraint satisfaction

Unit 3: Game Playing

- Overview of One & Two Player Game
- The Min-Max Search Procedure
- Alpha-Beta Cutoffs

BLOCK 2: Knowledge Representation

Unit 1: Propositional & Predicate Logic

- Syntax and semantics for prepositional logic
- Syntax & semantics of First Order Predicate Logic (FOPL)

- Properties of well-formed formula (wff)
- Conversion to clausal form
- Inference rules
- The resolution principle
- Non-deductive inference methods

Unit 2: Structured Knowledge Representations

- Production Rules
- Semantic Nets
- Frames
- Conceptual Dependencies and Scripts

Unit 3: AI Programming Languages

- Introduction to LISP
- Syntax and Numeric Functions
- Basic List Manipulation Functions in LISP Functions
- Predicates and Conditionals
- Input, Output, and Local Variables
- Iteration and Recursion
- Property Lists and Arrays
- PROLOG: List, Operators, Arithmetic
- Cut & Fail
- Backtracking

BLOCK 3: Handling Uncertainty

Unit 1: Handling Inconsistent and Incomplete Knowledge

- Truth Maintenance Systems
- Reasoning Techniques
- Concept of Uncertainty
- Bayes' Theorem
- Certainty Factors and Rule-Based Systems
- Bayesian Networks
- Dempster-Shafter Theory

Unit 2: Fuzzy Logic

- Fuzzy Sets
- Fuzzy Operators & Arithmetic
- Membership Functions
- Fuzzy Relations

BLOCK 4: Applications of Artificial Intelligence

Unit 1: Expert Systems

- Introduction and Concept of Planning
- Representing and Using Domain Knowledge
- Expert System Shells
- Knowledge Acquisition

Unit 2: Intelligent Agents

- Agents and environments
- Rationality and other performance measures
- Nature of environments
- Structure of agents

MCSE-004 Numerical and Statistical Computing 3 Credits

Objectives

The main objective of this course is to prepare the firm footing of learners in the domain of numerical and statistical computation. Understanding the concepts covered in the course, will make the learner to realize the need of Numerical and statistical components in computer science. Further, the concepts covered in this course will enable the analytical skill of the learner, and s/he may appreciate the need of this course in various domain of computer science viz. Software Reliability, Software Quality Assurance , Software Testing and many more.

Syllabus

BLOCK-1 Numerical Computing-I

Unit 1 Floating Point Arithmetic and Errors

- Floating Point Representation
- Sources of Errors
- Propagated Errors

Unit 2 Solution of Non-Linear Equations

- Bisection Method
- Regula-Falsi Method
- Secant Method
- Newton-Raphson Method
- Successive Iteration Method

Unit 3 Solution of Linear Algebraic Equations

Direct Method

- Gauss Elimination Method (without and with Pivoting)
- LU-Decomposition Method

Iterative Method

- Jacobi Method
- Gauss Seidel Method
- Successive Over Relaxation Method

BLOCK-2 Numerical Computing-II

Unit 1 Interpolation

- Differences – Forward and Backward Differences
  - Newton's – Forward and Backward Difference Formulas
  - Lagrange's Interpolation

Unit 2 Numerical Integration

- Newton – Cotes Formulas
- Composite Formulas
- Gaussian Quadrature

Unit 3 Numerical Solution of ODE

- Euler's Method
- Runge Kutta Method

BLOCK-3 Statistical Computing

Unit 1 Probability Distribution

- Discrete Distribution
- Binomial Distribution
- Poisson Distribution

Continuous Distribution

- Uniform Distribution
- Exponential Distribution
- Normal Distribution
- Chi-square Distribution

Unit 2 Pseudo Random Number Generation

- Uniform Distribution
  - Method of Generation (Discrete Case)
  - Inversion Method (Exponential Distribution)
  - Acceptance and Rejection

Unit 3 Regression

- Linear Regression Model
  - Least Square for Parameter Estimation
  - Goodness-of-Fit
  - Residual Analysis
- Non-Linear Regression

MCSE-011 Parallel Computing **3 Credits**

Objectives

In view of the limitations of the sequential paradigms in respect of solving difficult problems; over the years, a number of parallel/ concurrent paradigms have emerged that include parallel computer architectures, parallel operating systems, parallel algorithms and parallel programming languages. Based on these paradigms, parallel computer systems have been designed, developed and studied in depth. The purpose of the course is to equip students with skills for solving difficult problems using these paradigms, architectures etc.

MCSE-011 is a 3-credit course and the course material consists of three blocks. The pre-requisites for the course include knowledge of computer architecture, operating system, design and analysis of algorithm and problem solving and programming experience.

Syllabus

BLOCK –I Elements of Parallel Computing and Architecture

Unit 1 Introduction to Parallel Computing

- Basic concepts about program/process/ thread concurrent Execution Parallel Execution, granularity, Potential of Parallelism
- Need of Parallel Computation
- Levels of parallel processing
- Parallel processing Vs. Parallel computing
- Dataflow Computing concept
- Applications of parallel processing
    - Scientific Applications / Image processing
    - Engineering Application
    - Database query / Answering applications
    - A I Applications
    - Mathematical simulations and modeling

Unit 2 Classification of Parallel Computers

- Types of Classification
- Flynn's/ Handler classification
- UMA / NUMA /COMA
- Loosely coupled / tightly coupled
- Classification based grain size and Instruction level parallelism

Unit 3 Interconnection Network

- Need of Interconnection Network
- Concept Bandwidth Nod degree diameter bisection bandwidth, In degree and Out degree
- Static and Dynamic Interconnection network
- Omega, Parallel Shifter, Bens, permutation, hypercube, butterfly,
- Shuffle exchange Network

Unit 4 Parallel Computer Architecture

- Introduction to various computer architecture
- Pipeline processing
- Vector / Array processing
- VLIW and Super scalar architecture
- Associative architecture
    - Multithreaded architecture

BLOCK 2 Parallel Algorithm & Parallel Programming

Unit 1 Parallel Algorithm

- Introduction to Parallel Algorithms
- Analysis of Parallel Algorithms
- Different models of computation
    - Combinational circuit
    - Permutation Circuit
    - Sorting circuit
    - Matrix computation

Unit –2 PRAM Algorithms

- Message passage programming
    - Shared memory
    - Message passing libraries
    - Data Parallel programming
- Data Structures for parallel algorithms
    - Link list
    - Arrays pointers
    - Hypercube network

Unit 3 Parallel Programming

- Introduction to Parallel Programming
- Types of parallel programming
    - Programming based on message passing
    - Programming based on data parallelism
    - Programming for shared memory systems
    - Example programs for parallel systems

BLOCK –3 Advanced Topics

Unit 1 Operating System for Parallel Computers

- Basic issues of Operating Systems for Parallel Computers
- Process Management
- Resource Management
- Memory management
- I/O Management
- Inter-Processor Communication
- Vectorisation Compiler

Unit 2 Performance Evaluation

- Introduction to performance evaluation
- Metric of Parallel overhead
- Law Speedup
- Measurement Tools

Unit 3 Recent Trends for Parallel Computer

- Development of last 3 years
- Multicompontent CPU
- Apex architecture IA 64
- Hyperthreading

MCSP-060 Project **16 Credits**

The objective of the MCA project work is to develop quality software solution by following the software engineering principles and practices. It is only possible when a learner goes about with the task independently. During the development of the project the students 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 are encouraged to spend at least six man-months working on a project preferably in a software industry or any research organization. Topics selected should be complex and large enough to justify as a MCA project. The courses studied by the students during the MCA programme provide them the comprehensive background to work on diverse application domains. Student will receive Project Guidelines along with their 5th semester course material. Students should strictly follow and adhere to the MCSP-060 project guidelines.

Syllabus for BCS-012

BCS-012 BASIC MATHEMATICS

Students who took admission into MCA (from July 2013 session onwards), and did not have Mathematics at 10+2 level or at graduate level have to do BCS-012. They are advised to clear it along with the first year of MCA courses. However, all such students have to successfully complete BCS-012 (wherever applicable) before re-registering for MCA 5th semester.

No assignments need to be submitted for BCS-012. Also, the University offers no counseling sessions for BCS-012 course. Students need to appear only for the Term-end Examination for BCS-012. After completion of BCS-012, they would not get any certificate, however the marks will be reflected in the MCA grade card under the non-credit course column. This course (BCS-012) does not add to the credits of MCA programme and the marks will not be counted in the grand total.

Students need to secure **at least 40% marks in the Term-end examination for BCS-012 to be declared as successfully completed**. The syllabus is given below:

BCS-012: Basic Mathematics

Block-1: Algebra 1

Unit-1: Determinants

Determinants of order 2 and 3, properties and evaluation of determinants. Area of triangles using determinants, Cramer's rule.

Unit-2: Matrices -1

Definition, equality, addition and multiplication of matrices. Adjoint and inverse of a matrix. Solution of a system of linear equations – homogeneous and non-homogeneous.

Unit-3: Matrices -2

Elementary row operations; rank of a matrix, reduction to normal form, Inverse

of a matrix using elementary row operations.

Unit-4: Mathematical Induction

Principle of mathematical induction

Block 2: Algebra 2

Unit 1: Sequence and Series

Definition of sequence and series; A.P, G.P, H.P and A.G.P. $\sum n$, $\sum n^2$ and $\sum n^3$, Idea of limit of a sequence.

Unit 2: Complex Number

Complex number in the form of a+ib. Addition, multiplication, division of complex numbers. Conjugate and modulus of complex numbers. De Moivre's Theorem.

Unit 3: Equations

Quadratic, cubic and biquadratic equations. Relationship between roots and co-efficient. Symmetric functions of roots.

Unit 4: Inequalities

Solution of linear and quadratic inequalities.

Block 3 Calculus (Without Trigonometry)

Unit 1: Differential Calculus

Concept of limit and continuity; differentiation of the sum, difference, product and quotient of two functions, chain rule. Differentiation of parametric functions. 2^{nd} order derivatives.

Unit 2: Simple Application of Differential Calculus

Rate of change; monotoncity-increasing and decreasing; maxima and minima.

Unit 3: Integration

Integration as an anti-derivative. Integration by substitution and by parts.

Unit 4: Application of Integration

Finding area under a curve. Rectification.

Block 4 Vectors and Three-Dimensional Geometry

Unit 1: Vectors-1

Vectors and scalars, magnitude and direction of a vector. Direction cosines/ratio of vectors. Addition of two vectors. Multiplication of a vector by a scalar. Position vector of a point and section formula.

Unit 2: Vector-2

Scalar (Dot) product of vectors, Vector (Cross) product of vectors. Scalar triple product and vector triple product.

Unit 3: Three- Dimensional Geometry-1

Introduction, Distance formula. Direction cosines/ratio of a line passing through two points. Equations of a line in different forms; angle between two lines; Coplanar and skew lines. Distance between skew lines.

Unit 4: Linear Programming

Introduction, definition and related terminology such as constrains, objective function, optimization. Mathematical Formulation of LPP. Graphical method of solving LPP in two variables. Feasible and inferring solution (up to three non-trivial constraints)

5. EVALUATION SCHEME

Completion of the programme requires successful completion of both assignment component and the Term-end Examination component for each course in the programme. The total numbers of courses in this MCA programme are 31 and the total number of credits is 108.
Evaluation for each course covers two aspects:

(a) Continuous evaluation through Assignment with a weightage of 25% (please refer to the table below). *Viva- voce is compulsory for all the Assignments for which 20 marks are allocated.*

(b) Term-end examination with a weightage of 75% (please refer to the table below).

Note: ***A learner should not apply for appearing at the term-end examination of any course without getting registered for the same and that if s/he does so, her/his result would not be declared and the onus shall be on him.***

Assignments and Term - End Examination

The main purpose of assignments is to test student's comprehension of learning the materials they receive from the University and also to help them get through the courses by providing feedback to them. The information given in the printed course materials should be sufficient for answering the assignments. However, as Computer Science is an ever enhancing area, the students should make an attempt and work with extra reading material easily available at the Study Centre / Regional Centre libraries or through websites for working on the assignments. This will enhance his/her learning capabilities. Mostly the assignments are designed in such a way as to help her/him concentrate mainly on the printed course material, exploit their personal experiences and apply the knowledge gained from various sources.

Assignments

There will be **only one assignment for each course worth 100 marks (weightage of 25%)**. The set of all the assignments for each semester are given in one booklet that you will get along with your course material as well as the same will be uploaded on the IGNOU's website also.

The table shown below provides the detailed marking scheme for the MCA courses.

Seme-ster	Course Code	Course Title	Credits	Continuous Evaluation Assignment (Weightage – 25%)		Term End Examination Theory OR Practicals* (for Lab courses only) (Weightage – 75%)		
				Max Marks	Min. Marks	Duration	Max. Marks	Min. Marks
I	MCS-011	Problem Solving and Programming	3	100	40	3	100	40
	MCS-012	Computer Organization and Assembly language Programming	4	100	40	3	100	40
	MCS-013	Discrete Mathematics	2	100	40	2	50	20
	MCS-014	Systems Analysis and Design	3	100	40	3	100	40
	MCS-015	Communication Skills	2	100	40	2	50	20
	MCSL-016	Internet Concepts and Web Design	2	100	40	2	50	20
	MCSL-017	C and Assembly Language Programming Lab	2	100	40	2	50	20
II	MCS-021	Data and File Structures	4	100	40	3	100	40
	MCS-022	Operating System Concepts and Networking Management	4	100	40	3	100	40
	MCS-023	Introduction to Database Management Systems	3	100	40	3	100	40
	MCS-024	Object Oriented Technologies and Java Programming	3	100	40	3	100	40

	MCSL-025	Lab (based on MCS-021, 022, 023 & 024)	4	100	40	3	100	40
III	MCS-031	Design and Analysis of Algorithms	4	100	40	3	100	40
	MCS-032	Object Oriented Analysis and Design	3	100	40	3	100	40
	MCS-033	Advanced Discrete Mathematics	2	100	40	2	50	20
	MCS-034	Software Engineering	3	100	40	3	100	40
	MCS-035	Accountancy and Financial Management	3	100	40	3	100	40
	MCSL-036	Lab(based on MCS-032, 034 and 035)	3	100	40	3	100	40
IV	MCS-041	Operating Systems	4	100	40	3	100	40
	MCS-042	Data Communication and Computer Networks	4	100	40	3	100	40
	MCS-043	Advanced Database Management Systems	4	100	40	3	100	40
	MCSL-044	Mini Project	4	100	40		(50+25) ***	40
	MCSL-045	Lab(UNIX & Oracle)	2	100	40	2	50	20
V	MCS-051	Advanced Internet Technologies	3	100	40	3	100	40
	MCS-052	Principles of Management and Information Sytems	2	100	40	2	50	20
	MCS-053	Computer Graphics and Multimedia	4	100	40	3	100	40
	MCSL-054	Lab(based on MCS-051 & 053)	2	100	40	2	50	20
	MCSE-003 MCSE-004 MCSE-011	Each Elective Course**	3 each	100	40	2	100	40
VI	MCSP-060	Project	16				(150 + 50)***	60 +20

*** No practical examinations for the non-lab courses. Practical examination will be conducted for the lab courses only. The letter 'L' in the course code represents the lab course. Pass in each and every section in the practical course of Term End Practical Examination is compulsory in order to get it declared successful in the respective course.**

**** There will be 3 elective courses of 3 credits worth.**

*** The **Project consist of 2 components namely project report evaluation and viva. Viva-voce is compulsory and forms part of evaluation**. **A student in order to be declared successful in the project must secure 40% marks in each component (i) Project Evaluation and (ii) Viva-voce.**

All the assignments and term-end exams will be scored on a **numerical marking scheme.** Any component that has not been attempted would be treated as having a score of zero marks. The requirement for passing would be at least **40% in continuous evaluation and 40% in the term-end examinations,** with an **overall average of 40% for a pass in the course.**

The viva voce is compulsory for the assignment evaluation. For any course, in case, if a student submitted the assignment and not attended the viva-voce, then the assignment is treated as **not successfully completed** and would be marked as **ZERO.**

In order to be able to appear for the Term-end examination, it is a requirement that the student submit all the assignments according to the prescribed schedule. All students will be required to give an undertaking to this effect, and should it be later found that they had in fact not submitted the assignments as prescribed; the results for the Term-end examination will be treated as cancelled.

Viva-voce is compulsory for all the Assignments for which 20 marks are allocated.

Unfair means in attempting the assignments

If the learners copy the assignments, which is an important component of the ODL system, such assignments will be awarded "zero" and such students will be directed to re-attempt the fresh assignments pertaining to the next year which will indirectly delay the award of degree by a semester/ year.

Additional guidelines for Lab Course assignments and TEE

The following are the evaluation guidelines for the lab courses.

(i) Evaluation of Assignments for Lab Courses

The assignments of lab courses consist of three parts:

- Continuous assessment of practical sessions (lab records) (total 40 marks),
- Assignment questions (total 40 marks)
- A combined comprehensive **viva-voce (**total 20 marks)

The marks allotment details for various lab courses are shown in the following table:

Course code	**Continuous assessment of practical sessions lab records (40)**	**Assignment problems (40)**	**Combined Viva (20)**	**Total marks (100)**
MCSL-016	40	40	20	100
MCSL-017	Section –1(20) Section –2(20)	Section –1(20) Section –2(20)	20	100
MCSL-025	Section –1(10) Section –2(10) Section –3(10) Section –4(10)	Section –1(10) Section –2(10) Section –3(10) Section –4(10)	20	100
MCSL-36	Section –1(13) Section –2(13) Section –3(14)	Section –1(13) Section –2(13) Section –3(14)	20	100
MCSL-45	Section –1(20) Section –2(20)	Section –1(20) Section –2(20)	20	100

It is to be noted that minimum passing marks are overall (lab records + problems + viva) **40% in each assignment**.

(ii) Evaluation of term-end practical exam for Lab Courses

The term-end examination of the practical courses consists of several sections. Each section will be evaluated separately. The viva-voce for each section will also be separate. The following table shows the details:

(Practical questions –80 % and Viva-voce – 20 %)

Course Code	**Duration of term-end practical exam. (Each section gets equal time)**	**Term-end practical examination and viva-voce**			
		Marks Section-1	Marks Section-2	Marks Section-3	Marks Section-4
MCSL-016 (2 credits)	2 hours	40(P) + 10 (V) = 50 marks	#	#	#
MCSL-017 (2 credits)	2 hours	20 (P) +5(V) = 25 marks	20(P) + 5(V) = 25 marks	#	#

MCSL-025 (4 credits)	3 hours	20(P) + 5(V) = 25 marks	20(P) + 5(V) = 25 marks	20(P) + 5(V) = 25 marks	20(P) + 5(V) =25 marks
MCSL-036 (3 credits)	3 hours	25 (P) + 5(V) = 30 marks	25(P) + 5(V) = 30 marks	30(P) + 10(V) = 40 marks	#
MCSL-045 (2 credits)	2 hours	20 (P) + 5(V) = 25 marks	20(P)+ 5(V) = 25 marks	#	#

P- problems given in the exam paper, V –viva-voce for that section.

A student needs to obtain a minimum of 40% in **each section** of the term-end practical examination for successful completion of that particular section. In case a student does not secure the minimum passing marks in a section, s/he needs to appear for the term-end practical examination again for that section only.

Guidelines for MCS-044 (Mini Project)

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. The Mini Project involves practical work for understanding and solving problems in the field of computing. Every year, the list of problem definitions will change and will be sent as a separate booklet along with the course material/ Assignments.

(i) Project Proposal

Project proposal should be presented to, reviewed by and agreed upon in consultation with the project counselor to provide constructive feedback on the proposal and planned programme of the project work. No need of any formal approval to be taken on any proforma for MCS-044 project.

(ii) Mini Project (MCS-044) Report

The project report of MCS-044 will contribute to the assessment and your marks. The format of this report will follow the format, guidelines and suggestions given in the block, but details should also be discussed with your counsellor. The final reports of students doing **the project in a group should not be identical. Each student should emphasise on his/her role and responsibilities in the project work.**

(iii) Submission of the Project Report

One copy of the original MCS-044 project report is to be submitted to the Study Centre concerned. A photocopy of the same project report must be retained by the student and should be carried with him/her at the time of the viva-voce.

(iv) Evaluation Scheme of MCS-044

MCS-044 course has three main evaluation components consisting of assignment (25 marks), project report (50 marks) and viva-voce (25marks). **A student is required to score 40% marks in each of these components separately for successful completion of the course.**

The project will be assessed by a written report and a combined presentation and viva-voce. To help the students we have given some guidelines about evaluation and assessment in the next section. If the examiner finds that the project is lacking in any key areas then the student will be asked to re-submit the project by selecting a new topic in the next session.

(v) Re-submission of the project by the failed students

If the student fails in project report evaluation or viva-voce or in both, the students needs to redo the entire process by selecting a new problem from the list of problems which will be updated every year.

(vi) Assignment/ Continuous Evaluation

25% of total marks are allotted to assignment/continuous evaluation. The assignment questions are given in the MCA 4th semester assignment booklet.

If the student failed only in assignment component and successfully passed in project report evaluation and viva-voce, s/he needs to submit the fresh assignment of the current year, as is done in the normal courses.

(vii) Final Evaluation

The term-end practical examination of Mini Project will be conducted at the Study Centre concerned. 75% of total marks are evaluated in the final evaluation. Out of these 75 marks, 50 marks are allotted for the project report evaluation and 25 marks are allotted for the viva-voce.

Instructions for Assignments

While answering Assignments, the following guidelines are required to be followed:

1. Tips for assignments

The word limits for answering most of the questions are mentioned with them. If no word limit is prescribed, then assume it to be about 300 words. You will find it useful to keep the following points in mind:

(i) **Planning:** Read the assignment carefully. Go through the units on which they are based. Make some points regarding each question and rearrange these in logical order.

(ii) **Organisation:** Be a little more selective and analytical before drawing up a rough outline of your answer. In an essay-type question give adequate attention to your introduction and conclusion. The introduction must offer brief interpretation of the question and how you propose to develop it. The conclusion must summarize your response to the question. Make sure that your answer:

(a) is logical and coherent;
(b) has clear connection between sentences and paragraphs;
(c) is written correctly giving adequate consideration to your expression, style and presentation;
(d) does not exceed the number of words indicated (if any) in your questions.

(iii) **Presentation:** Once you are satisfied with your answers, you can write down the final version for submission, writing each answer neatly and underlining the points you want to emphasize.

2. The following format is to be followed for submission of the assignment:

The top of the first page of your response sheet for each assignment should look like this:

PROGRAMME TITLE :	ENROLMENT No. : .....
COURSE CODE :	NAME : .....
COURSE TITLE :	ADDRESS:.....
ASSIGNMENT CODE :	SIGNATURE : .....
STUDY CENTRE :	DATE : .....

3. Read instructions for submission of assignments given here. The assignments response sheets should be hand written. However the s/w coding, snapshots, test cases, etc. can be in

the printed form. **Students should not reproduce their answers from the units sent to them by the University. If they reproduce from the units, they will get poor marks for the respective question**.

4. The students should write each assignment separately. All the assignments should not be written in continuity.
5. **The students should write the question number with each answer. Photocopy of the submitted assignment is to be retained by the student for his or her own record and future reference, if any.**
6. The students should use only A4 size paper for their response and tag all the pages carefully. Avoid using very thin paper. They should allow a 4-cm. margin on the left and at least 4 lines in between each answer. This may facilitate the evaluator to write useful comments on the margins at appropriate places.
7. **The students should not copy the assignments from others. If copying is noticed, the assignments of such students will be rejected, and disciplinary action will be taken against the students as per rules of the University.**
8. **The completed assignment response should be sent to the Coordinator of the Study Centre**. **Under no circumstances should they be sent to the SED Division or the School at Headquarters**, for evaluation. After submitting the assignment at the Study Centre in person, the students should get the acknowledgement from the Co-ordinator on the prescribed assignment-cum-acknowledgement card (**Form No. 1**); otherwise, the assignment response should be sent under certificate of posting through post. The students should get back evaluated assignments from their Study Centres within one month of its submission for the feedback and for their future guidance.
9. In case the student has requested for a change of Study Centre, s/he should submit her/his assignments only to the original Study Centre until the University effects the change of Study Centre.

Guidelines Regarding the Submission of Assignments

1. It is compulsory for the students to submit all the prescribed assignments. They will not be allowed to appear for the term-end examination of a course if they do not submit the specified number of assignments in time for that course.
2. Whenever the students receive a set of assignments, they should check them immediately and ask for missing pages, if any, from Registrar (MPDD), IGNOU, Maidan Garhi, New Delhi-110 068 or the Co-ordinator of the Study Centre or else download them from the website.
3. The assignment responses should be complete in all respects. Before submission, the students should ensure that they have answered all the questions in all assignments. Incomplete answer sheets bring poor grades.
4. The Coordinator of the Study Centre has the right to reject the assignments received after the due date. Therefore, the students are advised to submit their assignments before the due date.
5. Students should enclose a self-addressed stamped assignment remittance-cum-acknowledgement card **(Form No. 2)** with each assignment response to ensure the delivery of assignments before the last dates prescribed for submission of assignments.
6. In case any student fails to submit the assignments or fails to score minimum qualifying marks, s/he has to wait for fresh assignments meant for the current batch of students. The request for the new assignments in the prescribed form **(Form No. 2)** is to be addressed to the Registrar, MPDD, Indira Gandhi National Open University, Maidan Garhi, New Delhi-110068.
7. For their own record, students should retain a photocopy of all the assignment responses, which they submit to the Co-ordinator of their Study Centre. If they do not get back their duly evaluated assignment within a month after submission, they should try to get it from their Study Centre personally. This may help them to improve upon future assignments.

8. As per the University norms, once the student's scores pass marks in an assignment, they can not re-submit it for improvement of marks.

9. Assignments are not subject to re-evaluation except for factual errors, if any. The discrepancy noticed by the students in the evaluated assignments should be brought to the notice of the Co-ordinator of the Study Centre, so that he forwards the correct score to the SED at the Headquarters.

10 The students should not enclose or express doubts for clarification, if any, along with the assignments. They should send their doubts in a separate cover to the Registrar, SED, Indira Gandhi National Open University, Maidan Garhi, New Delhi - 110 068. While doing so they should give their complete Enrolment number, name, address, programme code.

***Note* : Please submit your Assignments on or before the due date at your Study Centre.**

11. In case of not successfully completed or missed; the assignments should be demanded only if your registration for that course is valid.

12. Assignments should not be demanded to improve your score if you have secured minimum qualifying score in a course.

13. Please do not submit your assignment responses twice either at the same Study Centre or at different Study Centres for evaluation.

General Guidelines Regarding the Term-End Examination

1. To be eligible to appear the Term-end Examination in any course, the students are required to fulfil the following conditions:

   (a) registration for the courses, in which they wish to appear is valid,
   (b) they should have opted and pursued the prescribed courses
   (c) minimum time to pursue these courses is elapsed
   (d) they have also submitted the required number of assignment(s), if any.
   (e) they have submitted the online examination form of IGNOU and have paid the requisite examination fees.

2. The University conducts term-end examination twice a year, in June and December. The student can take the examination only after the minimum period prescribed for the course of study has elapsed.

3. Examination schedule indicating the date and time of examination for each course is sent to all the Regional Centres/ Study Centres in advance. The same is also notified through IGNOU Newsletter from time to time and displays on the website of IGNOU www.ignou.ac.in.

4. The online examination form is to be filled up from IGNOU website, in general, as per the following schedule (You MUST visit IGNOU website for actual cutoff dates. The details of late fee are displayed on the website. For June 2019 Term-end examination is INR 1000/-):

Term-End Examination	**Dates for filling up examination form**	
	(without Late Fee)	(With Late Fee)
June Term-End Examination	1st March to 31st March	1st April to 10th April
December Term-End Examination	1st September to 30th September	1st October to 10th October

You are required to pay examination fee per course at the time of filling up of the form. For June 2019 term-end examination this fee is @150/- per course for theory courses and @150/- per course for practical courses. You can pay online using Credit

Card / Debit Card /Net Banking while filling up the form. It may also be noted that in case, examination fee needs to be returned to student due to technical reasons, the fee will be refunded to the same account (Credit card/ Debit card/ Net Banking) from which the payment was made.

The link to online Examination form, in general, is put on the HOME page of IGNOU website. For example, For June 2019 term-end examination, you can fill up the form (provided you are filling up the form as per cutoff dates) from the link:

https://exam.ignou.ac.in/

YOU MUST READ and FOLLOW all the instructions very carefully. You can save these instructions for any future reference. These instructions relates to:

- **Dates for the Submission of Online Term End Examination form**
- **Prerequisite for the submission of the Term End Examination Form:**
- **Process to submit Term End Examination Form**
- **Examination fee and Mode of Payment**
- **Un-successful Submission of Exam Form**
- **Related to Refund excess Examination Fee**
- **Hall Ticket for Term End Examination**
- **Contact Details**

Important Guidelines and instructions for submission of Term End Examination form and other forms (Please note that guidelines and fee for forms may change, therefore, you are advised to read guidelines and fee details as per latest forms available online or on the IGNOU website)

1. Please ensure that you have already submitted the assignments as applicable for the courses you are filling in the Examination Form. You are required to pay examination fee for every course of theory as well as practical.
2. Students are requested to check the result status before filling examination form.
3. Select and enter Programme code and Examination Centre Code from the options available. If the centre opted by the student is not activated as examination centre or not allotted for any other reason, alternative examination centre will be allotted.
4. Select courses carefully. Courses for theory as well as practical need to be selected separately from the list appearing on the screen.
5. Students will be allowed to appear in Term-end Examination for the course(s) for which registration is valid and not time-barred and assignment(s) is/are submitted. Examination Fee once submitted will not be refunded.
6. Students should carry their **Identity Card and intimation slip** (download hall ticket from IGNOU website indicating Centre & Date of Examination) to the Examination Centre.
7. In case a student fails to receive the intimation slip/Hall ticket may please contact at SED (SE-II) http://www.ignou.ac.in/ignou/aboutignou/division/sed/contact branch.
8. Students must carry IGNOU Identity-Card in the Examination Hall for writing Examination. In case, students do not have IGNOU Identity card due to various reasons, they must get it issued (i.e. duplicate copy of IGNOU Identity card) from Regional Centre concerned well before the start of the Examination. Students are required to contact the RC in person (by post) and get the duplicate Identity card for attending Examination.
9. The students will be entitled to appear for the examination only at the examination centre allotted to them and **NOT** at any other centre without specific permission from the University. The Examination Centre once opted for in a form shall not be changed.
10. Although all efforts will be made to declare the results in time, there will be no binding on the University to declare the results of the last examination before the commencement of next examination. The students may, therefore, fill up the examination form without necessarily waiting for the result and get it cancelled at a later date, if so desired. In case the student gets result after filling up the exam form, s/he should not re-appear in the course qualified by her/ him with a view to improve the qualified score.
11. Students who fail to complete the minimum required number of course(s) prescribed for the Programme within the allotted period of study shall cease to be on the rolls of this University for that programme till they re-enroll themselves, if they wish to do so. Such students are advised to get in touch with the Regional Director concerned.

12. **Obtaining Photocopy of Answer Scripts:** After the declaration of result, if the students are not satisfied with the marks awarded, they can request the University for Photocopy of Answer Scripts on payment of ₹ 100/- per course. The request for obtaining Photocopy of Answer Scripts by the student must be made within 45 days from the date of declaration of result to the Evaluation Centre concerned in the prescribed format along with the fee of ₹ 100/- per course in the form of Demand Draft in favour of IGNOU payable at the city where submitting the request for Photocopy. Format is available on the IGNOU website: www.ignou.ac.in
13. **Early Declaration of Results:** In order to facilitate the students who have got offer of admission and or selected for employment etc and are required to produce marks-sheet/grade card by a specified given date may apply for early process of their answer-scripts and declaration of the results for this purpose. The students are required to apply in the specified format available on the University website with a fee of ₹ 1000/- per course through Bank Draft drawn in favour of IGNOU along with the attested photocopy of the offer of admission/employment offer. The students can submit their requests for early declaration before the commencement of the Term-end Examination i.e., before 1st June and 1st December respectively. The University in such cases will make arrangements for processing the answer-scripts and declare the results as a special case.
14. **Re-evaluation of Answer-script(s):** The University has replaced the scheme of rechecking with the re-evaluation whereby the answer-scripts will be re-evaluated by another Evaluator in case the students are not satisfied with the marks/grades secured by them in Term-end Examination. Such students can apply for re-evaluation within one month from the date declaration i.e. the date on which the results are made available on the University Website on payment of ₹750/- per course in the prescribed application form available on the University Website. The better of the two courses or original marks/grades and re-evaluated marks/grades will be considered and the revised marks/grades shall be incorporated in the students' record as applicable and the revised grade card/marks sheet will be sent to the students within one month from the receipt of application. Re-evaluation is not permissible for Projects, Practical, Assignments and Seminars etc.
15. **Improvement of Division/Class:** Keeping the interest of students who have completed their Bachelors Degree and Masters Degree Programmes, but falling short of 2% marks for securing 1st Division/2nd Division the university has made a provision for allowing such students to improve their performance. The improvement is permissible only in theory papers and the students may apply for improvement of their performance on the prescribed application format along with a fee of ₹750/- per course through a Bank Draft drawn in favour of IGNOU payable at Delhi and submit the application and fee to the Registrar, SRE Division, IGNOU, Maidan Garhi, New Delhi. The improvement is not permitted to those students who have completed their maximum duration of the programme. The students will be given only one opportunity to improve the marks/grades and they can apply for improvement a maximum of 25% of the credits for successful completion of the respective programme. However, the sealing for the number of courses in which the student can improve is five courses. The better of the two examinations i.e., marks already awarded and the marks secured in the improvement examination will be considered.

6. OTHER USEFUL INFORMATION

Reservation of Seats

The University provides reservation of seats for Scheduled Castes, Scheduled Tribes and Physically Handicapped students as per the Government of India rules.

Scholarships and Reimbursement of Fee

Reserved Categories, viz., Scheduled Castes, Scheduled Tribes and Physically Handicapped students etc. have to pay the fee at the time of admission to the University along with other students. Physically

advised to collect scholarship forms from the respective State Government Directorate of Social Welfare or Office of the Social Welfare Officer and submit the filled-in forms to them **through the Regional Director of IGNOU concerned.**

Similarly, SC/ST students have to submit their scholarship forms to the respective State Directorate of Social Welfare or Office of the Social Welfare Officer, **through the Regional Director of IGNOU concerned for suitable reimbursement.**

The Application for for reimbursement of Programme Fee to SC/ST students can be downloaded from the link**:**
http://ignou.ac.in/userfiles/Application%20form%20for%20Reimbursement%20of%20fee.pdf

Change/Correction of Address

There is a proforma **(Form No. 1)** for change/correction of address available in this programme guide. This form duly filled in is to be submitted to the **Regional Director concerned**. Students are advised not to write letters to any other officer in the University in this regard. Normally, it takes 4-6 weeks to effect the change. Therefore, the students are advised to make their own arrangements to redirect the mail to the changed address during this period.

Change of Regional Centre and Study Centre

Counselling facilities are not available for all the programmes at all the Study Centres. As such, students are advised to make sure that counselling facilities are available, for the subject s/he has chosen, at the new centre opted for. Request for change of Study Centre is acceded to subject to availability of seats for the programme at the new centre asked for only on compelling grounds. Students are required to get a NOC from the Regional center where they are willing to get themselves transferred in view of the practical sessions involved in MCA.

When a student wants transfer from one region to another, s/he has to write to that effect to the Regional Centre from where s/he is seeking a transfer marking copies to the Regional Centre where s/he would like to be transferred to and also to Registrar, Student Registration Division (SRD) , IGNOU, Maidan Garhi, New Delhi-110 068. Further, s/he has to obtain a certificate from the Co-ordinator of the Study Centre from where s/he is seeking transfer from, regarding the number of assignments submitted. The Regional Director from where the student is seeking the transfer will transfer all records including details of fee payment to the Regional Centre where the student is going, under intimation to the Registrar, SRD and the student. The transfer will be permitted only if seats are available at the new Study Centre.

Procurement of Official Transcripts

The University provides the facility of obtaining official transcripts on request, made by the learners in prescribed application form for official transcript, which provides details of fee, where to apply etc. Link to this form is given in the Section 9.

Duplicate Grade Card

The learner can apply for obtaining duplicate Grade Card in case the same has been lost/misplaced/damaged, by making a request in prescribed application form for Duplicate Grade card, which provides details of fee, where to apply etc. Link to this form is given in the Section 9.

Study Materials for Your Programme of Study

[1] After confirmation of admission, study materials are dispatched to the student's registered address by speed/ registered post.
[2] Keep checking status of dispatch of study materials on the IGNOU website using the weblink, www.ignou.ac.in/ignou/aboutignou/division/mpdd/material, provided by MPDD.
[3] You should visit Learner Support Centre (LSC) concerned with ID card for schedule of classes/lab
[4] If you not received Study Material then visit Regional Centre concerned only or write to mpdd@ignou.ac.in

Disputes on Admission and other University Matters
In case of any dispute, the place of jurisdiction for filing of a suit/plaint/petition will be only at New Delhi / Delhi.

7. SOME USEFUL ADDRESSES

For your information, the following officers deal with different educational aspects:

(i) Student Registration Related issues	Registrar, SRD, Indira Gandhi National Open University , Maidan Garhi, New Delhi -110068, 011-29532741 (SRD), 1302/1316 (SRD), Email: : registrarsrd@ignou.ac.in
(ii) Exam Centres, Results, Re-checking of answer-scripts, Discrepancies in Result, marks update, etc.	Registrar, SED, Indira Gandhi National Open University , Maidan Garhi, New Delhi -110068, Phone No: 011-29535828/2482 (SED), 011-29572204/2205(SED), FAX No.011-29534429 068
(iii) Study materials and Assignments, Admission , Fees, Scholarship,Change of Address/Study Centre/Regional Centre, Change of Course/Programme, Isssue of Bonafide Certificate, Migration Certificate, Duplicate Identity Card	Regional Director of the Regional Centre concerned.
(iv) Academic Matters	MCA Programme Coordinator SOCIS, C-Block, New Academic Complex IGNOU, Maidan Garhi, New Delhi - 110 068 Phone: 011-29572902 Email:mca@ignou.ac.in
(v) Administrative and counselling matters missing score of TMAs/Project assignments/Practical assignments, Assessment Sheets	Co-coordinator of your Study Centre/Regional Director of the Regional Centre concerned
(vi) Issue of Degree/ Diploma/ Certificate, Dispatch of returned Degrees, Verification of Degree	Dy. Registrar (Exam-1) Examination –1 Indira Gandhi National Open University, Maidan Garhi New Delhi -110068, Phone No.011-29535438 011-29572224/2213 e-mail exam1@ignou.ac.in
(vii) Issue of Provisional Certificates and Grade Cards	Dy Registrar (Exam-3) Phone No: 011-29536743; Intercom No. 2201
(ix) Declaration of pending results of TEE, Incorporation of practical marks, Verification of provisional certificate and grade card, Issue of transcripts	Dy. Registrar (Exam-3) Phone No: 011-29536103/6743 011-29572201/2211
(x) Non incorporation of assignment marks	Assistant Registrar (Assignment) Phone No: 011-29532294 Intercom No. 1312/1319/1325 E-mail: assignments@ignou.ac.in
(xi) Online students grievances Portal	**http://igram.ignou.ac.in/**

(xii) Students' General Enquiries	Student Support Centre Indira Gandhi National Open University, Maidan Garhi New Delhi -110068, Phone: 011-29535714, 29572512, 29572514, 29533869 and 29533870 e-mail : ssc@ignou.ac.in

Telephone numbers of the Divisions/ Schools are also provided on the website under the "Contact Us" option. Students are advised to be in touch with their Study Centres for advance/timely/day-to-day information or visit the website with URL www.ignou.ac.in

8. LINK TO OLD QUESTION PAPERS

You can download the previous year's question papers from IGNOU website. The following is the process of Downloading the question papers from IGNOU website:

Visit the IGNOU website at URL: http://www.ignou.ac.in and select the Download Button on IGNOU web site. On this Download Page select *Question Papers* link. The following page will be displayed (please note that URL of this page is: *https://webservices.ignou.ac.in/Pre-Question/*

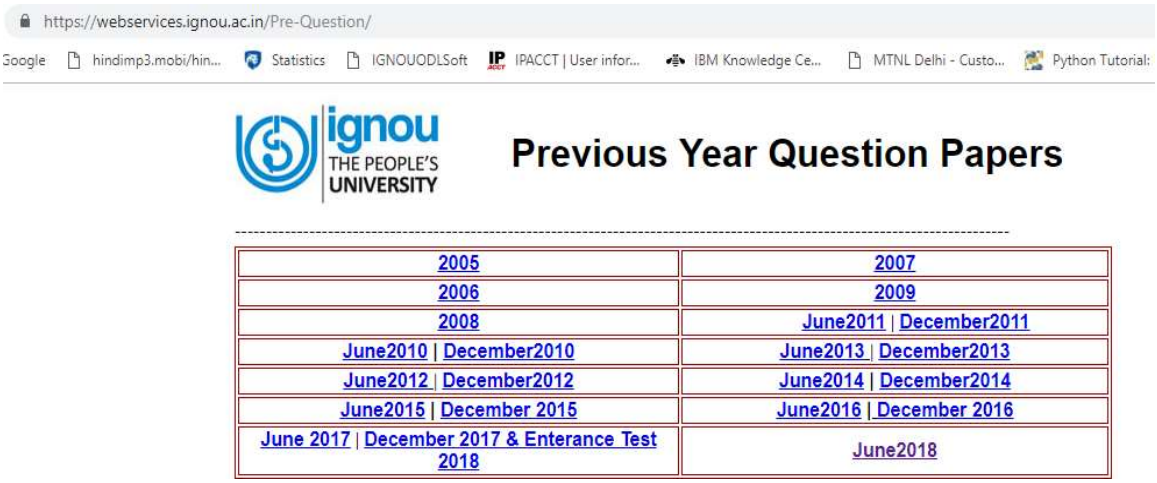

Figure 4: The Previous Year Question papers of IGNOU

Select the year of Question paper, this will display School wise list of Question papers, as the list is large you may use *find on page* option of your browser to find MCA old question papers (please note that you can search MCA old question papers by searching *MCS*.

9. LINKS TO FORMS AND ENCLOSURES

In this section, we are enclosing the IGNOU website links to various forms, which are useful for you. Whenever you have to correspond with the university, please download the form from the Website and fill it carefully and send as per instructions therein. The detailed instructions for all these-forms are provided in form itself. Some of these links may change, in those cases please use search option to find the desired link.

Note: You must Download the Forms from the Website

Forms and Useful links

- ***Change of Address (Form No. 1)***
- ***Assignments Remittance-Cum-Acknowledgement Card (Form No.2)***
- ***Link to Latest Assignment(s)***
- ***Link to Online Re-Registration for MCA Programme***
- ***Link to Online Term end Examination form***
- ***Link to form for early declaration of result***
- ***Link to form for obtaining photocopy of the answer script***
- ***Link to form for Re-evaluation of Answer script***
- ***Link to Application form for improvement in Division/Class***
- ***Link to form for obtaining Duplicate Grade Card / Mark-sheet***
- ***Link to form for issue of Official Transcript***
- ***Link to form for issue of Migration Certificate***

Change of Address (Form 1)
(It is attached on page No. 88)

Assignments related links

Assignment Remittance-cum-Acknowledgement (Form 2)
(It is attached on page No. 89)

Link to Latest Assignment(s)
https://webservices.ignou.ac.in/assignments/mca/index.html

Re-registration

Link to Online Re-Registration for MCA Programme
https://onlineadmission.ignou.ac.in/onlinerr/

Last date of Re-Registration is announced on the IGNOU website. In general, the re-registration is to be done 2-3 months prior to the start of session. For example, the last date of re-registration for session starting from July 2019 is 31 May 2019. Similarly, the last date for session starting January, 2020 may be 30 Nov, 2019.

Term end Examination and related links

Link to online Term End Examination form
https://exam.ignou.ac.in/

Link to form for Early Declaration of Result
http://www.ignou.ac.in/userfiles/APPLICATION%20FORM%20FOR%20EARLY%20DECLARATION%20OF%20RESULT%20OF%20TERM-END%20EXAMINATION.pdf

Link to Application Form for Obtaining Photocopy of the Answer Script
http://www.ignou.ac.in/userfiles/Application%20Form%20for%20botaining%20photocopy%20of%20the%20answer%20script.pdf

Link to form for Re-evaluation of Answer script
http://www.ignou.ac.in/userfiles/Application%20form%20for%20Reevaluation%20of%20Answer%20Scripts.pdf

Link to Application form for Improvement of Division/Class
http://www.ignou.ac.in/userfiles/Improvement%20form.pdf

Link to form for Duplicate Grade Card/Mark-sheet
http://www.ignou.ac.in/userfiles/Duplicate%20mark%20sheet%20form.pdf

Link to form for Issue of Official Transcript
http://www.ignou.ac.in/userfiles/Official%20Transcript%20form.pdf

Link to form for Issue of Migration Certificate
http://ignou.ac.in/userfiles/Migration%20Certificate.pdf

Form No. 1

(For Change of Address, send it duly filled-in to the concerned Regional Director, who will forward it to the Registrar (SRD), Maidan Garhi, New Delhi after verification)

Application for Change of Address

Date: _____

To

The Registrar, SRD
IGNOU
Maidan Garhi
New Delhi-110 068.

THROUGH THE REGIONAL DIRECTOR CONCERNED

Enrolment No._____

Programme_____

Name (in caps)_____

1. DETAILS FOR CHANGE/CORRECTION OF MAILING ADDRESS

New Address

_____

_____

_____

_____

City_____Pin_____

State_____

Old Address

_____

_____

_____

_____

City_____Pin_____

State_____

_____
Signature of the Student

Please retain a photocopy of any matter that you submit to the

Form No. 2

ASSIGNMENTS REMITTANCE -CUM-ACKNOWLEDGEMENT CARD

Enrol. No._____
Programme Title: _____

Name : _____

Course Code:_____Medium: _____

S.No.	Assignment No.

For Office Use Only

S .No. _____
Date of Receipt: ____
Name of Evaluator: _

Signature of the Student
Date : _____

Date of despatch to the Evaluator:
_____

Date of receipt from the Evaluator:
_____

INDIRA GANDHI NATIONAL OPEN UNIVERSITY

ASSIGNMENTS REMITTANCE -CUM-ACKNOWLEDGEMENT CARD

Enrol. No._____
Name :_____
Course Code: _____

Programme Title: _____
Medium : _____

S.No.	Assignment No.

For Office Use Only

S.No. _____

Signature of the recevier _____

Date : _____

Seal

Signature of the Student

Name : _____
Address of the Student : _____
Date : _____
(Please write your complete address and affix adequate postal stamp on reverse)

Affix Stamp Here

From:

The Coordinator
Study Centre concerned

To

(ADDRESS OF THE STUDENT)
……..
……..
……..

QR Code of Some of the Useful Web Links

eGyankosh
for Online Course Materials)

Online Re-Registration Form (

iGRAM
(IGNOU Grievance control Room)

To Watch Live Telecast/
To listen live Broadcast

Note: The above QR Codes can be scanned and open through and QR Code Scanner Application/App.