

**KRISHNA KANTA HANDIQUI STATE OPEN UNIVERSITY
(KKHSOU)**

**PROGRAMME PROJECT REPORT
ON
MASTER IN COMPUTER APPLICATIONS (MCA)**

**Submitted to
UNIVERSITY GRANTS COMMISSION
BAHADUR SHAH ZAFAR MARG
NEW DELHI -110 002**

**Submitted by
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KRISHNA KANTA HANDIQUI STATE OPEN UNIVERSITY**PROGRAMME PROJECT REPORT****MASTER IN COMPUTER APPLICATIONS (MCA)****FOR THE ACADEMIC SESSION 2018-19****1. Programme's Mission & Objectives**

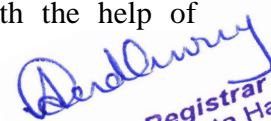
The mission of the MCA Programme in KKHSOU is to provide learning in computer science and application for generating skilled IT professionals capable of taking important roles in industry, academia, entrepreneurship and application. The objectives of the Programme are as follows.

- i. The programme will help the learners and teachers, especially those located in rural/backward/remote areas, to update their knowledge and skills
- ii. To create a friendly environment for the learners and faculty members for professional growth with high ethical standards.
- iii. To continuously upgrade the curriculum and SLM to train the learners in the latest technology for better employability.
- iv. To involve the learners for solving assignments in computer science and applications.
- v. To create a centre of excellence on ICT based ODL centres.

Master of Computer Application (MCA) is a three-year degree programme under semester system in which learners will be exposed to various areas of computer applications. The aim of the programme is to increase the number of IT professional and academicians in the state of Assam. This programme comprises 22 courses including practical and project work. There are six semesters in this course, and in each semester, there are 4 courses. The sixth semester involves one project work and two theory papers.

2. Relevance of the programme with KKHSOU's Mission and Goals

The programme has been designed keeping in mind the needs of the global Information Technology Industry. The curriculum and syllabus have been designed with the help of


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academician and industry expert incorporating both theory and practical components. While designing the syllabus it is considered that, the learners may come from very poor academic background and remote geographical areas. One of the main objectives of the University is to provide education to the people of geographically remote location. As such, it is assumed that this programme will certainly help the University to achieve its objectives.

3. Nature of prospective target group of learners:

The state of Assam is having a rich ethnic and cultural diversity. However, the people living in this region with different linguist groups and different culture are lagging behind in higher education. Moreover, the economic condition of the region is very poor as compared to other parts of the country. A large section of the young generation including girls, women and differently abled persons who are working at different Govt. and non-govt. organization after their graduation level education, in different remote places. These young and dynamic people are working in different sectors like telecom, finance, shopping malls and organized retail, drugs distributing firms, education sector (primary teaching and non-teaching), construction companies, IT etc. They are deprived of higher education due to poor economic condition, geographically remote area etc. The MCA programme will help this section of people in getting higher education through various study centres located across the state of Assam.

4 Appropriateness of the programme to be conducted in ODL mode to acquire specific skills and competence:

Like other National level higher educational institutes such as IGNOU, NIELIT (Previously DOEACC) and CISCO certification, it is possible to offer MCA programme in Open and Distance Learning Mode. It is observed that the candidates after completing the MCA or 'B/C' level from IGNOU or NIELIT are getting good jobs in either Govt. or private sectors. There are some learners, who have cleared UGC NET examination after completion of the MCA programme from IGNOU. It is observed that a large number of learners are seeking admission into this programme in the distance mode since all the learning materials are available in the internet. It may be mentioned that the NPTEL video lecture series are sufficient for the learners of the MCA Programme. The MCA programme of KKHSOU is offered through carefully designed SLMs, projects, assignments etc. with the help of the study centres. It could be

appropriate to conduct the programme through ODL mode to meet the skills in the emerging fields.

5. Instructional design

5.1 Curriculum design The curriculum has been designed with the help of the departmental experts along with external experts from the same discipline. At the time of designing the MCA syllabus, the following members were actively involved.

Sl. no	Name	Designation	Organization
1	Prof. Anjana Kakoti	Professor & Head	Dept. of Computer Science, Dean Faculty of Technology, Gauhati University
2	Prof. Diganta Goswami	Professor & Head	Dept. of Computer Science & Engineering, IIT, Guwahati
3.	Prof Jatin Deka	Professor	Dept. of Computer Science & Engineering, IIT, Guwahati
4.	Dr. Sanjib Kr. Kalita	Associate Professor	Dept. of Computer Science, KKHSOU
4	Dr. Tapashi Kashyap Das	Asst. Professor	Dept. of Computer Science, KKHSOU
5	Sruti Sruba Bharali	Asst. Professor	Dept. of Computer Science, KKHSOU

The syllabus is designed in such a way that without any prior knowledge of computers, the learners can take admission into this Programme. The details of syllabi are presented in **Annexure I**.

5.2. Course & Credits Distribution:

The semester-wise distribution of the different courses and credit of the MCA programme is as follows:

Course Code	Sem	MCA	Marks	Credit
MCA(S1)01	1st	Computer Fundamentals and PC Software	10+50+40p	4
MCA(S1)02		Digital Logic	20+80	4
MCA(S1)03		Computer Programming using C	10+50+40p	4
MCA(S1)04		Fundamentals of Networking and Web Technology	10+50+40p	4
MCA(S2)05	2nd	Computer Organization and Architecture	20+80	4
MCA(S2)06		Data Structure through C Language	10+50+40p	4
MCA(S2)07		Fundamentals of Database Management System	10+50+40p	4
MCA(S2)08		Project I	100	4
MCA(S3)09	3rd	Discrete Mathematics	20+80	4
MCA(S3)10		Object-Oriented Programming through C++	10+50+40p	4
MCA(S3)11		Operating System	20+80	4
MCA(S3)12		Design and Analysis of Algorithm	20+80	4
MCA(S4)13	4th	Advanced Database Management System	10+50+40p	4
MCA(S4)14		Management Accounting	20+80	4
MCA(S4)15		System Software	20+80	4
MCA(S4)16		Programming in Java	10+50+40p	4
MCA(S5)17	5th	Software Engineering	20+80	4
MCA(S5)18		Formal Language and Automata	20+80	4
MCA(S5)19		Data Communication and Computer Networks	20+80	4
MCA(S5)20		Elective I: Linux System Administration	10+50+40p	4
MCA(S6)21	6th	Advanced Web Technology	10+50+40p	4
MCA(S6)22		Elective II: Electronic Commerce	20+80	4
MCA(S6)23		Project II+ Viva-voce	200	8
Total Marks:			2400	96

20% marks in each course (without practical) and 10% (with practical) shall be for Home Assignment wherever indicated. Courses having practical are indicated with a letter 'p'.

Elective - I Linux System Administration

10+50+40p

Elective - II Electronic Commerce

20+80

1 credit = 30 hours of learning

4 credit=30x4=120 hours

6 credit=30x6=180 hours

5.3 Credit Hours: The University follows the system of assigning 30 hours of study per credit of a course. Thus, following this norm, a 4-credit course constitutes a total of 120 hours of study. Out of the total credit hours, a minimum of 10 percent, i.e., minimum 12 hours of counselling per course, is offered to the learners at their respective study centres.

5.4 Duration of the programme: The MCA programme has six semesters and is of minimum 3 years. However, the maximum duration of the programme is 8 years as stated below:

- Minimum Duration : 6 semesters (3 years).
- Maximum Duration : 8 years.

In case, a learner is not able to qualify a course in its first attempt, he/she will have to qualify in the particular course within the next four attempts, subject to maximum duration of the study.

5.5 Faculty and support staff: The dept. of Computer Science, KKHSOU has the following teaching staff.

Sl no	Name	Designation	Qualification
1	Dr. Sanjib Kr. Kalita	Associate Professor	MCA, Ph. D
2	Dr. Tapashi Kashyap Das	Asst. professor	MSc. Ph. D
3.	Sruti Sruba Bharali	Asst. Professor	M.Tech, UGC NET

5.6 Instructional delivery mechanism: All the study centres of KKHSOU, including the city study centre, which is in-house study centre of KKHSOU, are providing counseling sessions every Sunday. In certain situations, the following techniques are used

- i. PPT presentation using LCD projector
- ii. Video demo with the help of online.
- iii. NPTEL lecture demonstration.

5.7 Student Support Services: The student support services available in the MCA programme include the following:

- i.** Self-Learning Materials covering the entire syllabi,
- ii.** Counseling sessions at the study centres,
- iii.** Access to library services at the study centres and the Central Library of the University,
- iv.** Audio-Visual materials on selected modules, available at the study centres,
- v.** Community Radio programmes on selected topics.
- vi.** *Eklavya*, a radio programme broadcasted from All India Radio Station, Guwahati and simultaneously broadcasted by All India Radio Station, Dibrugarh.
- vii.** Live Phone-in-programme is broadcasted by All India Radio, Guwahati each Thursday (9.15 am – 10.15 am). In this programme, learners get live support to their queries, while the general public can also interact with officials/faculty members of the University on varied issues.
- viii.** Most of the Audio-visual programmes are made available online through YouTube videos.
- ix.** Learners can also write emails to any officials/faculty members of the University. For this, a general email ID: info@kkhsou.in has been created. Queries raised through email to this email id, is redressed by concerned official/faculty members of the University.
- x.** A Facebook Account is also available where the learners can communicate with their issues. The System Analyst of the University has been assigned as the Administrator of the account.
- xi.** An Android App “KKHSOU” has also been designed. This Android App can be downloaded free of cost from Google Play Store. Through this App, the learners can get detail information of academic programmes available, district-wise and course-wise list of study centres, contact information of the study centres, University etc. This Android App of the University has also been widely recognised and has received an **Excellence Award from IGNOU in 2017**.

Learners can register for a free SMS service. This SMS services keeps the learner updated on schedule of Examination, Declaration of results, Admission schedule and other important events.

6. Procedure of Admission, curriculum transaction and evaluation

6.1 Admission Procedure: A learner can take admission into the MCA programme through either online or offline mode. However, it is encouraged to take admission online. From the Academic Session 2018-19, online admissions will take place. A learner may take admission in the MCA programme at the selected study centres spread throughout the state of Assam.

For admission to the MCA programme, course fee is to be paid through the Bank challan attached with the Prospectus or through SBI e-collect at any branch of State Bank of India. Application along with necessary enclosures and a copy of the challan returned by the Bank after payment is required to be submitted at the recognized Study Centre within due date or upload the scanned copy of the documents online. Relevant documents are required to be submitted along with the admission form.

Those learners who are unable to complete the programme within the specified maximum period will be required to register themselves afresh by paying the requisite fee as per the University regulations.

6.2 Continuous Admission: After completion of a particular semester, a learner is required to apply for next semester simply by paying the necessary fees, within one month of the last examination day of the previous semester.

Admission in the subsequent semester does not depend on the results of the earlier semesters. One may take admission in the next semester even without appearing in previous semester examination. Admission should be taken continuously in the MCA programme without any break. A learner will be allowed to appear in all the examinations including back papers within the stipulated time of a programme.

6.3 Financial assistance: The University offers free education to the jail inmates and differently abled learners. At present, the University offers free of cost of education to jail inmates in thirteen district jails of the state. The University is in the process of offering the facilities in some more central / state jails from the next academic session.

The University also offers subsidised education to the learners living below the poverty line. On production of BPL certificate from competent authority, the University offers 50% discount on course fee.

6.4 Curriculum Transaction

The following supports are provided to the learners of the MCA programmes other than SLM:

- a. Counseling sessions at the respective study centres.
- b. ICT support: KKHSOU facilitates its learners with the following ICT based services:
 - i. University Website
 - ii. Community Radio Services
 - iii. Ekalavya (A special programme launched by KKHSOU with the help of Prasar Bharati of govt. of India)
 - iv. Akashvani Phone in Programme
 - v. e-BIDYA (An e-learning Portal)
 - vi. KKHSOU Mobile Application
 - vii. SMS Alert facilities
 - viii. Assignments (Continuous assessments)
- c. The University conducts semester-end examinations twice in a year.
- d. The home assignments are a part of the teaching learning process and are compulsory. The home assignment marks for each theory paper is 20.

6.5 The eligibility criteria for MCA Programme

Master of Computer Application (MCA)	<p>a. BCA/BSc (IT/CS) from KKHSOU or any other University recognised by UGC.</p> <p>b. Any Graduate (except Fine Arts) from KKHSOU or any other University recognised by UGC with Mathematics or Computer Science as one of the subjects at 10+2 level.</p> <p>c. Candidates not having Mathematics or Computer Science at 10+2 level shall have to take 3 additional papers namely, Additional Mathematics-1, Basic Science-1 and Computer Science and Application-1</p>
Master of Computer Application (Lateral Entry Scheme) [Lateral entry shall be with prior approval of the University only.]	<p>a. Any Graduate (except Fine arts) from KKHSOU or any other University recognised by UGC with DOEACC 'A' level or with PGDCA from KKHSOU or any other UGC recognised University having Mathematics or Computer Science at 10+2 Level can enroll themselves in third Semester of the MCA programme of KKHSOU.</p> <p>b. Candidates not having Mathematics or Computer Science at 10+2 level shall have to take 3 Additional papers namely, Additional Mathematics-1, Basic Science-1 and Computer Science and Application-1</p>

6.6 Fees structure: There are six semester in the MCA programme. The learners will need to pay fees every semester. The structure of fee is given below.

Progr amme	Se m	Enrolm ent Fee	Cours e Fee	Exa m Fee	Practica l Fee	Exam Centr e Fee	Mark - sheet Fee	Disser - tation Fee	Total Fees to be paid	Arrear Subjects
MCA	1	300	7,500	400	400	300	50	8,950	Rs.200 per paper + Practical Fee(if applicable) +Centre Fee + Mark sheet FeeRs.50+ Consolidate d Mark sheet Rs.100
	2	....	7,500	200	600	300	50	....	8,650
	3	....	7,500	600	200	300	50	....	8,650
	4	....	7,500	600	200	300	50	....	8,650
	5	....	7,500	800	....	300	50	....	8,650
	6	....	7,500	200	400	300	150	1,000	9,550

6.7 Evaluation: The academic quality and performance of the learners are evaluated through home assignments and end-semester examinations. The University adopts both ongoing and term end evaluation. Ongoing evaluation will be conducted in two modes: internal and external. The internal evaluation is to be undertaken by the learners themselves. For this, the University has designed some Check Your Progress questions, which would help the learners to self-check his progress of study. However, this is undertaken at the learners' end by the learners themselves and is non-credit based. For the overall evaluation of a course, the University follows two types of evaluation:

Continuous Evaluation (Assignments)	: Weightage assigned 20%
Term End Evaluation (Semester-end Examinations)	: Weightage assigned 80%

- i. The learners will have to submit the assignments within the schedule of a semester at the respective study centres. The counsellors at the study centres evaluate the assignments and return them to the learners with feedback.
- ii. Term end examinations are conducted on scheduled dates at selected examinations centres. Evaluations are done by the external examiners at the zonal centres. After evaluation, further scrutiny is done, followed by moderation. Results are declared within scheduled dates as laid down in the Activity Planner.
- iii. Learners will be able to get their scripts re-evaluated if they are not satisfied with evaluation.
- iv. Questions for the Semester-end papers will be set as per the Evaluation policy of the University that covers all the modules of the respective courses.
- v. The University is in the process of using high security and eco-friendly synthetic (water-proof and termite proof) papers for mark sheets and certificates. Moreover, use of interactive kiosk at the study centres for issue of admits card and modification of the existing EDPS system for quick publication of results of examinations are also being planned. Similarly, introduction of biometric identity of learners is also being planned.

7. Requirement of the laboratory support and Library Resources

7.1 Laboratory support: The study centre offering MCA programme must have a well-equipped computer laboratory. There should be at least 10(ten) computers along with sufficient UPS backup facility and high-speed internet connection. Depending upon the enrolment the

number of computers may be more than 10. The learner-computer ratio should be 2:1. The number of practical learning hours is mentioned in the SLM itself. The SLM is designed in such a way that learners do not require having any practical guidebook. The SLM itself has instructions to proceed with laboratory work. At present, KKHSOU is having a computer laboratory with the following configuration.

Sl no	Item	Quantity
1	Desktop Make HP/Model; Specification :Intel core2duo, 2GB DDR RAM 320 GB HDD SATA 18.5” TFT Monitor/Windows 7 Professional & Key Board & Mouse	15
2	600 VA UPS	15
3	High speed Internet connection	
4	Connected with LAN	

7.2 Library support:

The Central Library at KKHSOU has a sizeable repository of relevant reference books and textbooks relating to Computer applications and allied areas. The total number of books available in the area of computer science and allied areas in the library is 634 (registered as on 30/08/2017). As on 07-09-2017, the central library of KKHSOU has a collection of 17,988 books in general. The books available at the Central Library are quite helpful for the faculty members, the SLM writers as well as the content editors. It may be mentioned here that copies of relevant reference books and textbooks have also been sent to the libraries of the respective study centres, which can be accessed by the learners.

The digital version of the University Central Library, KKHSOU is also available on the website: <http://www.kkhsou.in/library/>, which is an online platform for collecting, preserving and disseminating the teaching, learning and intellectual output of the University to the global community. On this website, the entire catalogue (title/ author/ publisher wise) of library resources including books and other literature relating to this particular course, and the Open Access Search Engine (OAJSE), which is a gateway to over 4,500 e-journals including those in computer applications and allied areas, can be accessed among others.

7.3 Proposed Laboratory support: The department of Computer Science, KKHSOU is proposing a new well-equipped computer laboratory at the city study centre with the following configuration.

Sl No.	Item	Qty required
1	<p>Tower Server Make: HP/Model; HP ProLiant ML350 Gen9-SFF Perform Specification: 1 x Intel® Xeon® E5-2620v4 (2.1GHz/8-core/20MB/85W) Processor/24 DiMM Slots/HP 16GB (1x16GB) Dual Rank x4 DDR4-2133 CAS-15-15-15 Registered Memory Kit/8 SFF (2.5inch) Hot Plug / 2XHP 1TB 6G SAS 7.2K rpm SFF (2.5-inch) SC /HP Smart Array P440ar 2G controller/DVD RW/2 x 800W FS Plat Ht Plg Pwr /HPE Embedded Ethernet 1Gb 4--port 331i Adapter/HP iLO (Firmware: HP iLO4) with 2GB NAND OS: Microsoft Windows Server 2012 R2 Standard Edition ROK /18.5” TFT Monitor/Key Board & Mouse/3 Yrs. 24x7 4Hr On site Warranty</p>	1
2	<p>HP Workstation Specification : Intel Xeon E5-2697 v2 2.70Ghz 30MB 1866 12C 1st 16GB DDR3-1866 (4x4GB) 1CPU Registered RAM 16X Super Multi DVDRW SATA 1st ODD/ Windows 10 Pro 64 bit</p>	1
3	<p>Desktop Make HP/Model; HP 280G2Specification : Intel core i7-6700U 6th Generation/8GB DDR4 RAM 1 TB HDD SATA HDD/Optical Disk drive: No ODD On Board Graphics/ 18.5” TFT Monitor/Windows 10 Professional & Key Board & Mouse /3 years OEM warranty</p>	20
4	<p>Laptop Make HP/Model: HP Pro book 440 G4 Specification : Intel core i7-7500U 7th Generation 8GB DDR4 / 1 TB SATA HDD/ No ODD/14” LED Full HD/Backpack Operating System: Windows 10 Professional 3 years OEM warranty</p>	5
5	<p>Color LaserJet(Print, Copy, Scan, and Fax) Make: HP/Model; LaserJet Pro MFP M277dw Specification:</p> <ul style="list-style-type: none"> • Prints up to 18 ppm1 A4 (Blk/Clr) • 800 MHz processor with 256MB RAM • Duty Cycle up to 30,000 pages • RMPV: 250 to 2,500 pages2 • Black (best): Up to 600 dpi; Color (best): Up to 600 dpi 	1

6	HP ScanJet Enterprise 7500(Legal flatbed) 1 Flatbed Scanner Series Specification: • Up to 50 ppm/100 ipm • Up to 3,000 pages per day; Hi-Speed USB 2.0 • Up to 600 dpi scanning resolution	1
7	10 KVA On Line UPS(3Phase-1 Phase) Make : Numeric Backup: 60 Minutes Backup Battery: 24 NosX100 AH SMF Battery With Accessories/ 1year On UPS & Battery Warranty	1
8	a)Air Conditioner(2.0 Ton) Make: IFB	2
	b)Stabilizer	2
	c) Starter	2
	d) Fitting charge	
9	Cat6 Cable (610 Mtrs -2 Box) Make: Digilink	2 box
10	Patch Panel 24 Port Loaded Make: Digilink	3 box
11	I/o With SMB Make: Digilink	20 nos
12	2 Mtr Patch Cord Make: Digilink	20
13	1 Mtr Patch Cord Make: Digilink	20
14	9 U Rack with Accessories Make: Val Rack	1
15	24 Port Gigabit Unmanaged Switch Make: Digisol Model:DG-GS-1024 D	2
16	8 Port Gigabit Unmanaged Switch Make: Digisol Model:DG-1008	1
17	RJ 45	40
18	Cat 6 Cable laying with conduit	20
19	Net working Intimation Charge	100
20	Furniture	20 set
21	LCD projector	1

The University is in the process of adding the additional infrastructure to augment the facilities from the Academic Session 2018-19.

8 Cost estimate of the Programme and the Provisions:

The office of the Finance Officer of KKHSOU keeps all the records of finances regarding printing of SLMs, honorarium paid to the members of the Expert Committee, honorarium to be paid to Content Writers, Content Editors, Language Editors, Translators, Proof Readers, and the expenditure related to organizing counsellors' workshops, meeting of the co-ordinators of the study centres etc. Moreover, the finance office also maintains records of purchase of computers, online space, books, journals etc. The accounts are maintained as per the laid down procedures of Government.

The SLMs prepared are to be delivered to various study centres located at the far-flung remote areas. On an average, the University delivers about 15 kgs of study materials per student. The cost of delivery of 1 kg of such material is Rs.10. Accordingly, depending upon the number of candidates; the cost for the MCA programme will be provisioned by the University. The office of the Finance Officer has calculated the delivery cost of SLM per student at Rs. 150.00.

The University will keep financial provisions for organizing stake-holders' meetings, counselling workshops etc. as per the Academic Plan and Academic Calendar approved by the Academic Council of the University. The workshops conducted by the University will not only benefit the learners of the MCA programme, but will also benefit the learners of other programmes. The University will also bear the cost of organizing the meeting of Syllabus Revision Committee etc., and also of supplying additional study materials if required for improving the quality of the programme. Moreover, the University will keep on investing in developing the IT infrastructure so that the learners can benefit from the ICT enabled programme. The figures, as indicated above, will be applicable for the MCA programme of the University. The University will keep adequate financial provision for development, delivery, and maintenance of the programme presented as per the Programme Project Report.

There are four main heads for the expenditure to run the MCA programme. They are

- A. Curriculum and SLM development [non recurring]
- B. Laboratory setup [non recurring]
- C. Teaching staff [Recurring]
- D. Annual maintenance [Recurring]

Based on historical costing method, an exercise was carried out by the Department and the findings are presented below.

A. SLM development: SLM development process includes syllabus design, manuscript writing, content editing, language editing, formatting, printing and binding. The cost for developing the SLM for a particular course is as follows

- i. Manuscript writing (per unit) : Rs. 4000/-(for 15 units Rs. 60000/-)
- ii. Content editing : Rs. 10,000/-(per course)
- iii. Language editing : Rs. 10,000/-(per course)
- iv. Printing & binding : Rs. 64,000/-(per course for 500 copies)

Total : Rs. 1,44,000/-

	Course1 (15 unit)	Course2 (15 unit)	Course3 (15 unit)	Course4 (15 unit)
Sem I (Dev. & Printing cost)	144000/-	144000/-	144000/-	144000/-
Sem II (Dev. & Printing cost)	144000/-	144000/-	144000/-	
Sem III (Dev. & Printing cost)	144000/-	144000/-	144000/-	144000/-
Sem IV (Dev. & Printing cost)	144000/-	144000/-	144000/-	144000/-
Sem V (Dev. & Printing cost)	144000/-	144000/-	144000/-	144000/-
Sem VI (Dev. & Printing cost)	144000/-	144000/-		

Total cost for SLM: Rs. 30,24,000/-

(Thirty lakh twenty four thousand only)

B. Laboratory setup cost: The computer laboratory is having 20 computers.

Sl No.	Item	Unit Price	Qty required	Total Price
3	Desktop Make HP/Model; Specification :Intel core i3 /4GB DDR4 RAM 1 TB HDD SATA HDD/Optical Disk drive: No ODD On Board Graphics/ 18.5" TFT Monitor/Windows 10 Professional & Key Board & Mouse /3 years OEM warranty	32500.00	20	65000.00
5	Color LaserJet(Print, Copy, Scan, and Fax) Make: HP/Model; LaserJet Pro MFP M277dw	67000.00	1	67000.00

	Specification: <ul style="list-style-type: none"> • Prints up to 18 ppm1 A4 (Blk/Clr) • 800 MHz processor with 256MB RAM • Duty Cycle up to 30,000 pages • RMPV: 250 to 2,500 pages2 • Black (best): Up to 600 dpi; Color (best): Up to 600 dpi 			
6	HP ScanJet Enterprise 7500(Legal flatbed) 1 Flatbed Scanner Series Specification: <ul style="list-style-type: none"> • Up to 50 ppm/100 ipm • Up to 3,000 pages per day; Hi-Speed USB 2.0 • Up to 600 dpi scanning resolution 	90000	1	90000.00
7	20 KVA On Line UPS(3Phase-1 Phase) Make : Numeric Backup: 60 Minutes Backup Battery: 24 NosX100 AH SMF Battery With Accessories/ 1year On UPS & Battery Warranty	471845.00	1	471845.00
8	a)Air Conditioner(2.0 Ton) Make: IFB	47000.00	2	94000.00
	b)Stabilizer	5000.00	2	10000.00
	c) Starter	1000.00	2	2000.00
	d) Fitting charge			2000.00
9	Cat6 Cable (610 Mtrs -2 Box) Make: Digilink		1 box	6780.00
10	Patch Panel 24 Port Loaded Make: Digilink		2 box	8720
11	I/o With SMB Make: Digilink		20 nos	8250.00
12	2 Mtr Patch Cord Make: Digilink	150.00	20	3000.00
13	1 Mtr Patch Cord Make: Digilink	140.00	30	5200.00
14	9 U Rack with Accessories Make: Val Rack	6900.00	1	6900.00
15	24 Port Gigabit Unmanaged Switch Make: Digisol Model:DG-GS-1024 D	7000.00	1	7000.00
16	8 Port Gigabit Unmanaged Switch Make: Digisol Model:DG-1008	2120.00	1	2120.00
17	RJ 45	15.00	60	900.00
18	Cat 6 Cable laying with conduit	610.00 mtr	30	18300.00
19	Net working Intimation Charge	50.00	100	5000.00

20	Furniture	3000.00	30 set	90000.00
21	LCD projector	240000.00	1	240000.00
22	Renovation			500000.00
			Total	1704015.00

C. Teaching staff: It is assumed that in each course there will be 20 counseling sessions held during a semester. The honorarium for teachers per class is Rs. 1000/-. Therefore, the total expenditure for the entire programme will be:

	Course 1 (15 unit)	Course 2 (15 unit)	Course 3 (15 unit)	Course 4 (15 unit)
Sem I	20000/-	20000/-	20000/-	20000/-
Sem II	20000/-	20000/-	20000/-	20000/-
Sem III	20000/-	20000/-	20000/-	20000/-
Sem IV	20000/-	20000/-	20000/-	20000/-
Sem V	20000/-	20000/-	20000/-	20000/-
Sem VI	20000/-	20000/-		

Total Rs. 360000 (Rupees three lacks sixty thousand only)

D. Maintenance cost: The annual maintenance cost for the computer laboratory will be approximately Rs. 2, 00,000/- (Rupees two lakhs only) per year. So, for a period of three years, it will be Rs. 6,00, 000/- (Rupees six lakhs only).

The approximate cost estimate for programme development, delivery and maintenance will be

Sl no	Head of expenditure	Expenditure(Rs.)
A	Curriculum and SLM development [non recurring]	30,24,000.00
B	Laboratory setup [non recurring]	17,04,015.00
C	Teaching staff [Recurring]	3,60,000.00
D	Annual maintenance[Recurring]	6,00,000.00
	Total	56,88,015.00/-

Note: The cost as presented above would be applicable for a period of three years as the programme has duration of three years. Approximations were attempted to arrive at figure to make it representative and reflective.

9. Quality assurance mechanism and expected programme outcomes:

9.1 Quality Assurance Mechanism:

With regard to the quality concerns of the course materials, the department is involved in the following activities:

- i. The programme design and structure is decided upon after a series of discussions and deliberations with a team of carefully chosen subject experts, who are mostly eminent scholars and professionals from the reputed institutions of higher education. Formed with due approval from the University authority, this expert Committee is helped by the in-house department faculties while preparing the framework of the programme.
- ii. The next step after the completion of the framework preparation is the allotment of the assigned papers (which again comprises 12-15 units) to the assigned authors. The in-house faculty members prepare a carefully chosen list of authors for the task. The in-house faculties also contribute their writings, besides the outsourced authors, who are mostly research scholars and faculty members from higher educational institutions.
- iii. The content editors are then roped in for the next round. The content editors, who are mostly academics from reputed higher educational institutions, look into the contents of the units, and provide their suggestions and feedbacks to be included by the coordinator of the programme.
- iv. The newly constituted CIQA Office is planning to conduct stakeholders meeting; SLM and Counselling Workshops which is expected to provide the University and the Department with required inputs for quality enhancement.
- v. In order to keep the programme updated, the programme would be revised and necessary changes would be incorporated for the benefit of the learners, based on the inputs received from the mechanism as mentioned above.

9.2 Learning Outcomes:

After the completion of the MCA programme, the learners will be able to do the following:

- a. Can peruse for higher education like M. Tech, M. Phil, Ph. D.
- b. Developing dynamic web application.
- c. Developing smart phone based apps.

- d. Computer network installation and configuration.
- e. PC maintenance and troubleshooting.
- f. IT enabled services.
- g. Developing and handling animated software
- h. Graphics designer
- i. Animation designing
- j. Independently manage a computer laboratory.

Annexure I

MCA Programme Structure and Detailed Course wise Syllabus: (Total Credits: 96)

Course Code	Sem	MCA	Marks	Credit
MCA(S1)01	1st	Computer Fundamentals and PC Software	10+50+40p	4
MCA(S1)02		Digital Logic	20+80	4
MCA(S1)03		Computer Programming using C	10+50+40p	4
MCA(S1)04		Fundamentals of Networking and Web Technology	10+50+40p	4
MCA(S2)05	2nd	Computer Organization and Architecture	20+80	4
MCA(S2)06		Data Structure through C Language	10+50+40p	4
MCA(S2)07		Fundamentals of Database Management System	10+50+40p	4
MCA(S2)08		Project I	100	4
MCA(S3)09	3rd	Discrete Mathematics	20+80	4
MCA(S3)10		Object-Oriented Programming through C++	10+50+40p	4
MCA(S3)11		Operating System	20+80	4
MCA(S3)12		Design and Analysis of Algorithm	20+80	4
MCA(S4)13	4th	Advanced Database Management System	10+50+40p	4
MCA(S4)14		Management Accounting	20+80	4
MCA(S4)15		System Software	20+80	4
MCA(S4)16		Programming in Java	10+50+40p	4
MCA(S5)17	5th	Software Engineering	20+80	4
MCA(S5)18		Formal Language and Automata	20+80	4
MCA(S5)19		Data Communication and Computer Networks	20+80	4
MCA(S5)20 A		Elective I: Linux System Administration	10+50+40p	4
MCA(S5)20 B		Elective I: Image Processing	10+50+40p	
MCA(S6)21	6th	Advanced Web Technology	10+50+40p	4
MCA(S6)22 A		Elective II: Electronic Commerce	20+80	4
MCA(S6)22 B		Elective II: Data Warehousing and Data Mining	20+80	
MCA(S6)23		Project II+ Viva-voce	200	8
Total Marks:			2400	96

20% marks in each course (without practical) and 10% (with practical) shall be for Home Assignment wherever indicated. Courses having practical are indicated with a letter 'p'.

Elective - I	Linux System Administration	10+50+40p
	Image Processing	10+50+40p
Elective - II	Electronic Commerce	20+80
	Data Warehousing and Data Mining	20+80

1 credit = 30 hours of learning

4 credit=30*4=120 hours

**MCA (S1) 01: Computer Fundamentals and PC Software
DETAILED SYLLABUS
4 credits: 120 hours of learning**

UNIT 1: Introduction to Computer [5 hours, 5 marks]

Block Diagram of Computer, Evolution, Generations, Classification and its Application

Unit 2: Number System [10 hours, 8 marks]

Representation of numbers (only a brief introduction to be given) and characters in computer, Binary, Hexadecimal, Octal, BCD, ASCII, EDCDIC and Gray codes, Conversion of bases, Representation of signed integers, Sign and magnitude, 1's complement and 2's complement representation, Arithmetic operations using 2's complement representation and conditions for overflow/underflow and its detection.

UNIT 3: Basic Components of Computer [7 hours, 8 marks]

Concept of Bit and Byte; Block Diagram of Computer, CPU, ALU, CU; Computer Memory: Primary and Secondary; Input/Output Devices; Buses: Address, Data Control

UNIT 4: Computer Security [5 hours, 5 marks]

Computer Virus, Worm, SpyWare, Malware, Trojan Horse, Antivirus Software.

UNIT 5: Cyber Crimes & Legal Framework [5 hours, 5 marks]

Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Cyber Pornography, Identity Theft & Fraud, Cyber terrorism, Cyber Defamation, Different offences under IT Act, 2000

UNIT 6: Hardware Configuration [7 hours, 5 marks]

Different hardware configuration(Laptop/desktop), Typical RAM/ Harddisk size, Mother board series, different OEM(original equipment manufacturer), Processor series, FCC & UL for quality measure.

UNIT 7: Introduction to OS [7 hours, 5 marks]

Definition and functions of an Operating System, Types of OS (Single User, Multi user, Single tasking, Multitasking, Real time, Network OS, Distributed OS)

UNIT 8: MS DOS Operating System [7 hours, 6 marks]

Introduction to DOS, System files of DOS, concept of Booting, Files and Directory Structure, Concept of Paths, Internal and External commands, Batch File.

UNIT 9: MS Windows Operating System [7 hours, 6 marks]

Features of Windows 7, Exploring Components of Windows: The Desktop, The Icons, Working with Windows, The Start Menu and Taskbar, Quitting Windows; Customizing the Desktop, Files and Folders.

UNIT 10: LINUX Operating System [10 hours, 8 marks]

Open Source and Free Software, Advantages and Disadvantages of Linux Operating System, Concept of Path, Basic Linux Commands, File Permission, Text Editor vi.

UNIT 11: Microsoft Word-Part I [10 hours, 8 marks]

Starting MS-Word, Document Window and its Components, Different Bars, Document View, Creating a New Document, Saving a Document, Opening an Existing Document, Exiting MS-Word, Working with Text, Working with Paragraph, Bullets and Numbering, Find and Replace, Copy, Cut and Paste

UNIT 12: Microsoft Word-Part II [10 hours, 8 marks]

Spelling and Grammar Checking, Undo and Redo option, Header and Footer, Page Setup, Printing Documents, Inserting Picture, Working with Tables: Inserting Table, Deleting Table, Traversing Table, Selecting a Table, Rows and Columns, Deleting Rows and Columns, Merge and Split Cells; Creating Multiple Columns

UNIT 13: Microsoft Excel [10 hours, 7 marks]

Starting MS-Excel, Working with Toolbars, Row, Column and Cell, Working with Excel: Creating a New Workbook, Working with Cells and Fonts, Merging Cells, Inserting and Deleting Rows and Columns; Saving a Workbook, Closing a Workbook;

UNIT 14: Functions of Excel [10 hours, 8 marks]

Different Operators used in Excel; Working with Formula and Functions; Sorting Data; Working with Charts.

UNIT 15: Microsoft PowerPoint [10 hours, 8 marks]

Starting MS-PowerPoint, Creating a New Presentation, Working with Slides, Applying Text and Graphics, Applying Themes, Customizing Slide Show, Saving, Running and Closing a Presentation, Opening an Existing Presentation

MCA (S1) 02: Digital Logic
DETAILED SYLLABUS
4 credits: 120 hours of learning

Unit 1: Introduction to Number Systems [8 hours, 5 marks]

Decimal, Binary, Hexadecimal and Octal number system, Number system conversion

Unit 2: Binary Arithmetic [8 hours, 6 marks]

Complement: r 's and $(r-1)$'s complement, Binary addition, Binary subtraction, Binary Multiplication, Binary division.

Unit 3: Data Representation [8 hours, 6 marks]

Fixed Point representation and Floating point representation

Unit 4: Code Conversion [8 hours, 5 marks]

Gray code, BCD, BCD to Excess-3 code conversion technique, ASCII, EBCDIC

Unit 5: Boolean algebra [5 hours, 5 marks]

Introduction, Properties, De-Morgan's Theorem, Boolean Identities

Unit 6: Logic Gates [5 hours, 5 marks]

Logic Gates: AND, OR, NOT, NAND, NOR, XOR; Conversion of the logic gates

Unit 7: Floating point number representation [8 hours, 5 marks]

Floating point number, Normalization of floating point, overflow and underflow, detection of overflow, IEEE floating point standard

Unit 8: Logic Families [8 hours, 6 marks]

Introduction, Register Transistor Logic(RTL), Integrated Injection logic(IIL), Diode- Transistor Logic(DTL), Emitter-Coupled Logic(ECL), Transistor- Transistor Logic(TTL), TTL-NAND, Tri State Logic, MOS devices, Logic gates with MOSFET's

Unit 9: Reduction Techniques [10 hours, 10 marks]

Boolean Expression, SOP, POS, Conversion of SOP to POS and vice-versa, Simplification of Boolean expression by Algebraic method and Karnaugh Map, Don't care condition

Unit 10: Combinational circuit [10 hours, 8 marks]

Multiplexer, 4-to-1 multiplexer, Demultiplexer, Encoder, Priority encoder, Decoder, 3-to-8 decoder,

Unit 11: Binary arithmetic circuits [10 hours, 8 marks]

Binary Half adder, Full adder, Binary Half subtractor, Full subtractor, 1's complement of n bit adder/subtractor

Unit 12: Sequential circuit [10 hours, 10 marks]

Synchronous and Asynchronous Sequential circuit, Flip-Flop and its different types: RS, JK; Master-Slave JK Flip-Flop

Unit 13: Registers [8 hours, 8 marks]

Shift register, SISO, PISO, SIPO, PIPO shift register, Application of Shift Register

Unit 14: Counters [8 hours, 8 marks]

Synchronous and Asynchronous Counter, Limitations of asynchronous counter, Frequency division counter

Unit 15 Memory organization [6 hours, 5 marks]

Memory types, Random access memory, Access time, RAM package, Static RSM, CMOS memory cell, Dynamic RAM, Read Only Memory, Memory expansion

**MCA (S1) 03: Computer Programming using C
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Introductory Concepts [5 hours, 5 marks]

Basic definition of Pseudo Code, algorithm, flowchart, program

Unit 2: Elements of C Programming [6 hours, 5 marks]

Characters used in C, Identifiers, Keywords, Tokens, Constants, Variables, Types of C variables, Receiving input and output

Unit 3: Variables and Data types [6 hours, 5 marks]

Integer, character floating point and string; Initialization of variable during declarations; Symbolic Constants, type conversion in assignment

Unit 4: Operators and Expressions [8 hours, 5 marks]

Expression in C, Different types of operators: Arithmetic, Relational and Logical, Assignment, Conditional, Increment and decrement, Bitwise, Comma and other operator (size of, period etc). Precedence and associativity of operators, type casting

Unit 5: I/O Functions [10 hours, 6 marks]

Header Files (stdio, conio), Formatted Input/Output Functions (scanf, printf), Escape Sequences, Character Input/Output Functions (getch, getchar, putchar, gets, puts, getche, clrscr)

Unit 6: Preprocessor Directives [5 hours, 5 marks]

Features of C preprocessor, Macro expansion, Macros with arguments, #if and #elif directives,

Unit 7: Conditional Statements [7 hours, 8 marks]

Conditional Statement- if, if- else, nested if-else, switch-case; break, continue, goto

Unit 8: Loop Control Structures [10 hours, 8 marks]

Concept of Loops, Types of loop: while, do-while, for; nested loops

Unit 9: Storage Class [5 hours, 5 marks]

Automatic, External, Static, Register, Scope and lifetime of variables, Macro, Preprocessor directive

Unit 10: Arrays [10 hours, 8 marks]

Array, Array Declaration, 1-Dimensional array, 2-Dimensional array

Unit 11: Strings [10 hours, 7 marks]

String, String Handling Functions: strlen(), strcmp(), strcpy(), strrev(), strcat(), etc

Unit 12: Functions [10 hours, 8 marks]

Function, Function declaration, Function definition, Function call, Formal and Actual parameter, Recursive function

Unit 13: Pointers [10 hours, 7 marks]

Pointer, Pointer declaration, Passing pointer to a function, Pointer and one-dimensional arrays, Dynamic memory allocation

Unit 14: Structures and Union [10 hours, 10 marks]

Structure Declarations, Definitions, Defining your typedef, Array of Structure, Pointer to Structure. Union Declaration, Definition, Declaration, Uses

Unit 15: File Handling [8 hours, 8 marks]

Concept of File, File Pointer, File Opening in various modes, closing a file, reading and writing on files, Formatted Input/Output, fseek(), ftell(), rewind()

MCA (S1) 04: Fundamentals of Networking and Web Technology
DETAILED SYLLABUS
4 credits: 120 hours of learning

UNIT 1: Basics of Computer Network [10 hours, 8 marks]

Computer Network: Definition, Goals; Broadcast and Point-To-Point Networks; Connectionless and Connection-Oriented Services; Network Devices; Network Topologies; Types of Network: LAN, MAN, WAN; Server Based LANs and Peer-to-Peer LANs; Transmission Types; Modes of Communication; Switching Techniques

UNIT 2: Network Models [10 hours, 8 marks]

Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model: Functions of each Layer; Various Terminology used in Computer Network; Connection-Oriented and Connectionless Services, Internet (TCP/IP) Reference Model, Comparison of ISO-OSI and TCP/IP Model

UNIT 3: Transmission Media [5 hours, 5 marks]

Transmission Medium, Guided Media: Coaxial Cable, Twisted Pair, Fiber Optics Cable

UNIT 4: Wireless Transmission [7 hours, 5 marks]

Introduction, Electromagnetic spectrum, Radio transmission, Microwave transmission, Lightwave transmission, Transmission impairments: Attenuation, delay distortion, noise, modem, RS 232, RS 499

UNIT 5: Data Link Layer [8 hours, 8 marks]

Introduction, Data link layer design issue, Services provided to the Network layer, Framing, Error control, Flow control, Error detection and correction, Error detecting codes

UNIT 6: Data Link Protocol [8 hours, 8 marks]

Introduction, Unrestricted simplex protocol, Stop-and-wait protocol, Simplex protocol for noise channel, sliding window protocol, one bit sliding window protocol, Protocol using Go Back

UNIT 7: Medium Access Sublayer [8 hours, 8 marks]

Introduction, Channel allocation problem, Static and Dynamic channel allocation, ALOHA, Carrier sense Multiple Access Protocol Collision Free Protocol, Manchester encoding, Token Bus, Token Ring

Unit 8: Network Layer [8 hours, 8 marks]

Internetworks, Addressing, Routing, Network Layer Protocols: ARP, IP, ICMP, IPV6, Unicast routing, Unicast

Unit 9: Transport Layer [8 hours, 7 marks]

Process-To-Process delivery, user data gram, Transmission control protocol

Unit 10: Application Layer [8 hours, 6 marks]

Client-Server Model: Client-Server model, Socket interface; A brief introduction to DNS, SMTP, FTP

UNIT 11: Network Security [8 hours, 6 marks]

Introduction, Traditional cryptography, cryptology, secret key algorithm, Public key algorithm, RSA algorithm, Digital signature, Authentication protocol

UNIT 12: Internet Basics [8 hours, 5 marks]

Internet: Architecture, Accessing, Internet Service Providers (ISP), Organization of Internet Protocol suite, IP Address, DNS, URL; World Wide Web (WWW): Web Page, Web Servers, Web Browsers, Cookies

UNIT 13: Static Web Page Design [8 hours, 5 marks]

Basics of HTML; Document Structure tags; Formatting tags; List tags; Hyperlink and Image tags; Table tags; Frame tags; Form tags

UNIT 14: HTML Tags and XML [8 hours, 5 marks]

HTML Form; Additional Advanced HTML Tags; Introduction of XML

UNIT 15: JavaScript [8 hours, 8 marks]

Client Side Programming; Basic Programming Concepts; Control Structures in JavaScript; Array; Functions; Working With Form Object; Built-in Objects in JavaScript, User Defined Objects in JavaScript

MCA (S2) 05: Computer Organization and Architecture
DETAILED SYLLABUS
4 credits: 120 hours of learning

Unit 1: Basic organization of the computer [5 hours, 5 marks]

Basic organization of the computer and block level description of the functional units from program execution point of view; Fetch, decode and execute cycle

Unit 2: Digital Components [8 hours, 8 marks]

Flip-Flops, Counter, Register, Half adder, Full Adder, Half subtractor, Full subtractor, Coder-Decoder, Multiplexer, De-multiplexer, Magnitude Comparator

Unit 3: Data Representation [8 hours, 5 marks]

Data representation, computer arithmetic and their implementation; control and data path, data path components, design of ALU and data path, control unit design

Unit 4: Computer Arithmetic [8 hours, 5 marks]

Integer representation, sign magnitude representation, twos complement representation, integer arithmetic

Unit 5: Instruction Sets [8 hours, 6 marks]

Elements of a machine instruction, instruction representation, Simple instruction format, Instruction types, number of addresses, Types of operands, Types of operations. Different Instruction Formats, Instruction Types, Instruction Execution, Assembly language notation

Unit 6: Addressing modes [8 hours, 5 marks]

Addressing: Immediate, Direct, Indirect, Registrar, Registrar indirect, Relative

Unit 7: Input-Output Organization [8 hours, 8 marks]

Different I/O techniques (Programmed I/O, Interrupt-Driven I/O), DMA (Direct Memory Access), I/O Processors

Unit 8: Introduction to Cache and Virtual Memory [10 hours, 8 marks]

Memory Hierarchy, Semiconductor memories, internal organization of typical RAM and ROM Memory, Switches, Cache memory, Cache memory access techniques; Mapping functions, Virtual memory, Locality of reference, Paging, Cache Coherence Problem

Unit 9: Memory and I/O access [10 hours, 8 marks]

Memory Read Write operations, Concept of handshaking, Polling Techniques (Serial and Half Polling) and Interrupt driven I/O, Priority and Daisy Chaining Technique, Introduction to Memory Mapping, Basic concept of Cache and Virtual Memory

Unit 10: Memory and I/O Interfacing [8 hours, 8 marks]

I/O processor, Priority Encoder, Device Scheduler, Interfacing with the I/O Devices, keyboard, printer and display interfaces

Unit 11: External Memory [8 hours, 8 marks]

Magnetic Disk, Magnetic read write operation, sector, track, inter track and inter sector gap, cylinder, fixed head disk, seek time, access time, transfer time, rotational delay, RAID, Optical memory, Magnetic tap

Unit 12: Processor structure and Function [10 hours, 8 marks]

Processor organization: Fetch instruction, Interpret instruction, fetch data, process data, write data, Registrar organization, Control and status registrar, Instruction cycle, Instruction pipelining(definition only)

Unit 13: Introduction to Parallel Processing [5 hours, 5 marks]

Introduction to Pipelining and Basics of Parallel Processing, Scalable Architecture

Unit 14: CISC and RISC Architecture [5 hours, 5 marks]

CISC (Complex Instruction Set Computers), RISC (Reduced Instruction Set Computers), Examples of CISC and RISC

Unit 15: Parallel Architectures [10 hours, 8 marks]

Classification, SISD, SIMD, MISD, MIMD, Scalar, vector, superscalar and pipelined processor, Pipelining, Instruction pipeline, pipeline bubbles, Hazards: -resource conflicts, data dependency, branch difficulty. Vector computing, arithmetic pipeline, vector and scalar register, chaining, scatter gather operations, vector-register processor, memory-memory vector processor. Array processor

MCA (S2) 06: Data Structure through C Language
DETAILED SYLLABUS
4 credits: 120 hours of learning

UNIT 1: Introduction to Data Structure [10 hours, 10 marks]

Basic concept of data, data type, Elementary structure, Arrays: Types, memory representation, address translation functions for one & two dimensional arrays and different examples.

UNIT 2: Algorithms [5 hours, 5 marks]

Complexity, time-space, Asymptotic Notation

UNIT 3: Linked List [10 hours, 8 marks]

Introduction to Linked List, representation of single linked list, linked list operations: Insertion into a linked list, deletion a linked list, searching and traversal of elements and their comparative studies with implementations using array structure.

UNIT 4: Stack [8 hours, 7 marks]

Definitions, representation using array and linked list structure, applications of stack

UNIT 5: Queue [8 hours, 7 marks]

Definitions, representation using array, linked representation of queues, application of queue.

UNIT 6: Searching [7 hours, 6 marks]

Linear and Binary search techniques, Advantages and disadvantages, Analysis of Linear and Binary search

UNIT 7: Sorting [10 hours, 8 marks]

Sorting algorithms (Complexity, advantages and disadvantage, implementation), bubble sort, insertion sort, selection sort, quick sort

UNIT 8: Trees [8 hours, 7 marks]

Definition and implementation: Binary Tree, Tree traversal algorithms (inorder, preorder, postorder), postfix, prefix notations; Binary Search Tree: Searching in BST, insertion and deletion in BST.

UNIT 9: Dictionary ADT [8 hours, 7 marks]

Search trees, balancing of search trees – AVL trees, Red-Black trees, multi way search trees, 2-3 trees, splay trees, Insertion and Deletion in each of the above data structures, Hashing

Unit 10: Advance Sorting and Selection Techniques [10 hours, 6 marks]

Heap sort, Shell sort, sorting in linear time, Counting sort, Radix sort. Medians and order Statistics Selection and Adversary arguments. Lower bound on sorting

Unit 11: Priority Queue ADT [8 hours, 6 marks]

Heaps-extended priority queue, min(max) heaps, binomial heap, fibonacci heap and its amortized analysis.

Unit 12: Partition ADT [5 hours, 5 marks]

Union-find algorithms through weighted merge and path compression

Unit 13: Data Structure for external storage operations [7 hours, 5 marks]

B-tree, insertion and deletion in B-trees, external sorting, B⁺ tree

Unit 14: Red Black Tree [6 hours, 5 marks]

Definition, properties, Creation, Insertion, left and right rotation, balancing red black tree, deleting node from red black tree

Unit 15: Graph [10 hours, 8 marks]

Introduction to Graph, Graph representation: adjacency matrix, adjacency list, Traversal of graph: depth first search and breadth first search.

**MCA (S2) 07: Fundamentals of Database Management System
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: File Structure and Organization [8 hours, 5 marks]

Data and Information, Concept of Field, Key Field; Records and its types, Fixed length records and Variable length records; Files, operation on files, Primary file organization.

Unit 2: Database Management System [8 hours, 5 marks]

Definition of DBMS, File processing system vs. DBMS, Advantages and Disadvantages of DBMS, Database Architecture, Data Independence, Data Dictionary, DBMS Language, Database Administrator.

Unit 3: Data Models [8 hours, 8 marks]

Data Models: Object Based Logical Model, Record Base Logical Model, Relational Model, Network Model, Hierarchical Model, Entity-Relationship Model: Entity Set, Attribute, Relationship Set, Entity Relationship Diagram (ERD), Extended features of ERD.

Unit 4: Relational Databases [10 hours, 10 marks]

Relational data model; Terms: Relation, Tuple, Attribute, Cardinality, Degree, Domain; Keys : Super Key, Candidate Key, Primary Key, Foreign Key; Relational Algebra- Operations: Select, Project, Union, Difference, Intersection, Cartesian Product, Natural join.

Unit 5: SQL (Part I) [10 hours, 8 marks]

Introduction of SQL, characteristic of SQL, Basic Structure, DDL Commands, DML, DQL, SELECT Statement, WHERE Clause, Useful Relational Operators, Aggregate Functions, SUM Function, AVG Function.

Unit 6: SQL (Part II) [10 hours, 10 marks]

Compound Conditions and Logical Operators, AND Operator, OR Operator, Combining AND and OR Operators, IN Operator, BETWEEN Operator, NOT Operator, Order of Precedence for Logical Operators, LIKE Operator, Concatenation Operator, Alias Column Names, ORDER BY Clause, Handling NULL Values, DISTINCT Clause

Unit 7: Relational Database Design [10 hours, 8 marks]

Introduction to Normalization, Anomalies of un-normalized database, Normal Form : 1NF, 2NF, 3 NF, , BCNF , 4 NF , dependency-preserving property , lossless join property , algorithms to ensure dependency -preserving property and lossless join property

Unit 8: System implementation techniques [8 hours, 8 marks]

Query processing and optimization- translation between SQL queries and relational algebra; Transaction processing- transaction and system concepts, desirable properties, schedules and recoverability

Unit 9: Concurrency control [6 hours, 5 marks]

Locking techniques, concurrency control based on timestamp ordering, multiversion concurrency control techniques

Unit 10: Database recovery [6 hours, 5 marks]

Concepts and techniques, recovery in multi database systems

Unit 11: Security and authentication [6 hours, 5 marks]

Issues, access control techniques, introduction to multilevel security

Unit 12: Object oriented database systems [6 hours, 5 marks]

Concepts of object-oriented databases; Standards, languages and design; Object relational database systems

Unit 13: Distributed databases [8 hours, 6 marks]

Concepts; Data fragmentation, replication, and allocation techniques; Types of distributed database systems; Query processing in distributed databases; Overview of concurrency control and recovery in distributed databases

Unit 14: Image, multimedia, and spatial databases [8 hours, 6 marks]

Concepts of Image, multimedia, and spatial databases; Content-based indexing and retrieval

Unit 15: Indexing techniques [8 hours, 6 marks]

Introduction, R trees, R+ trees, KD trees

MCA (S3) 09: Discrete Mathematics
DETAILED SYLLABUS
4 credits: 120 hours of learning

Unit 1: Sets [8 hours, 6 marks]

Sets – the Empty Set, Finite and Infinite Set, Equal and Equivalent set, Subsets, Power set, Universal set, Venn diagram, Complement of a set, set operations

Unit 2: Relations and Functions [8 hours, 6 marks]

Concept of relation: identity and inverse relation, types of relation, equivalence relation; Concept of function: identity and constant function, types of function.

Unit 3 :Lattices [8 hours,7 marks]

Lattices as partially ordered sets, their properties. Lattices and algebraic systems. Sub lattices, direct products and homomorphism. Some special lattices for example complimented and distributive lattices.

Unit 4: Propositional Logic – I [8 hours, 7 marks]

Statements, logical connectives, truth tables

Unit 5: Propositional Logic – II [8 hours, 7 marks]

Tautologies, contradictions, logical equivalence, Applications to everyday reasoning

Unit 6: Predicate Logic [8 hours, 7 marks]

An axiom system for the Predicate Calculus, Truth tables as an effective procedure for deciding logical validity

Unit 7: Boolean Algebra [8 hours, 6 marks]

Boolean Algebra, Relation of Predicate Calculus to Boolean algebra

Unit 8:Recurrence Relations[8 hours, 6 marks]

Homogeneous linear equations with constant coefficients, particular solution, difference table, finite order differences

Unit 9: Counting Principles [8 hours, 6 marks]

The Pigeonhole principle - counting; Permutation and Combination: Definition of Permutation and combination, Simple application of permutation and combination, Principle of Inclusion-Exclusion

Unit 10: Basic Algebraic Structure – I [8 hours, 6 marks]

Binary operations, identity and inverse of an element, group, subgroup, coset, cyclic group, normal subgroup, quotient group

Unit 11: Basic Algebraic Structure – II [8 hours, 6 marks]

Ring, Commutative Ring, Integral domain and Field

Unit 12: Codes and Group codes [8 hours, 6 marks]

Group Code, Additional Results From Boolean Matrices, Decoding And Error Correction Maximum Likelihood Technique

Unit 13: Graph Theory [8 hours, 8 marks]

Basic concepts- finite and infinite graphs, incidence and degree, isolated and pendant vertices, null graph; Paths and Circuits- isomorphism, subgraphs, walks, connected and disconnected graphs and components, Euler graphs, Bi-partite graphs, Hamiltonian paths and circuits;

Unit 14: Trees [8 hours, 8 marks]

Properties of trees, distance and centers, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, spanning trees in weighted graphs; Cut-sets- properties, connectivity and separability, network flows; Matrix representation of graphs- incidence matrix, submatrices, circuit matrix, cut-set matrix, path matrix, adjacency matrix;

Unit 15: Graph Coloring [8 hours, 8 marks]

Introduction, Covering and Partitioning- basic concepts; Directed graphs- definition, types, directed paths and connectedness, Euler digraph, tress with directed edges.

**MCA (S3) 10: Object-Oriented Programming through C++
DETAILED SYLLABUS
4 credits: 120 hours of learning**

UNIT 1: Introduction to Object-Oriented Programming [5 hours, 5 marks]

Basic concept of OOP, Comparison of Procedural Programming and OOP, Benefits of OOP, C++ compilation, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and C++

UNIT 2: Elements of C++ Language [8 hours, 5 marks]

Tokens and identifiers: Character set and symbols, Keywords, C++ identifiers. Variables and constants: Integers & characters, Constants and symbolic constants, Dynamic initialization of variables, Reference variables, Basic data types in C++, Streams in C++, scope resolution operator

UNIT 3: Operators and expressions [8 hours, 5 marks]

Operators, Types of Operators in C++, Precedence and Associativity, Manipulators, Enumerated data type, storage classes

UNIT 4: Decision and Control Structures [8 hours, 5 marks]

if statement, if-else statement, switch statements, Loop: while, do-while, for; Jump statements : break, continue, goto

UNIT 5: Array and Structure [8 hours, 6 marks]

Arrays, structure, unions, Runtime memory management: new and delete operator

UNIT 6: Pointer [7 hours, 6 marks]

Introduction, Address operator, pointer variable, pointer definition, pointers and parameter passing, void pointer, pointer arithmetic, Runtime memory management: new and delete

operator, Pointers to pointer, Passing address of a pointer, Array of Pointers, Pointers to functions

UNIT 7: Functions [7 hours, 6 marks]

main() function, components of function : prototype, function call, definition, parameter; passing arguments; types of function, inline function, function overloading

UNIT 8: Introduction to Classes and Objects [8 hours, 6 marks]

Classes in C++, class declaration, declaring objects, Defining Member functions, Inline member function, Array of objects, Objects as function argument, Static data member and member function, Friend function and friend class

UNIT 9: Constructors and Destructors [7 hours, 6 marks]

Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Constraints on constructors and destructors, Dynamic initialization of objects

UNIT 10: Operator Overloading [10 hours, 10 marks]

Overloading unary operators: Operator keyword, arguments and return value; Overloading Unary and binary operators: arithmetic operators, manipulation of strings using operators, Type conversions.

UNIT 11: Inheritance [10 hours, 8 marks]

Derived class and base class: Defining a derived class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class.

UNIT 12: Virtual Functions and Polymorphism [10 hours, 10 marks]

Virtual functions, Pure virtual functions; Polymorphism, Categorization of polymorphism techniques: Compile time polymorphism, Run time polymorphism.

UNIT 13: File Handling [8 hours, 8 marks]

File classes, Opening and Closing a file, File modes, Manipulation of file pointers, Functions for I/O operations

UNIT 14: Templates [10 hours, 8 marks]

Introduction, Function template, Function template overloading, Class templates, Template arguments

UNIT 15: Object Oriented Design [6 hours, 6 marks]

Object Oriented Design Approaches, Object Modeling Techniques (OMT) tools: Object Model, Dynamic Model, and Functional Model. (Object Diagram, State Diagram, and DFD), Phases of Object-Oriented Development: Object Analysis, System Design, Object Design

**MCA (S3) 11: Operating System
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Review of computer organization [5 hours, 5 marks]

Major subsystems, instruction sets, I/O organization.

Unit 2: Introduction to Operating System [8 hours, 5 marks]

What is an operating system, batch system, multi-programmed system, time-sharing system, personal computer operating system, parallel systems, distributed systems, real-time systems.

Unit 3: Processes [8 hours, 7 marks]

Process (process models, process hierarchies, process states), Threads (what is thread and its use, design issues of thread).

Unit 4: Interprocess Communication [10 hours, 8 marks]

Interprocess communication, race conditions, critical-sections, mutual exclusion, solution to race condition, disabling interrupt, Peterson's solution, sleep & wake up (The Producer Consumer Problem), Semaphores

Unit 5: Scheduling [10 hours, 9 marks]

Basic concepts, primitive and non-primitive scheduling, scheduling algorithms, types of scheduling - batch, interactive and real-time, goals of scheduling algorithms, first come first serve, shortest job first and round robin scheduling.

Unit 6: Deadlocks [10 hours, 9 marks]

What is deadlock, principles of deadlock (deadlock conditions & modelling), deadlock detection, recovery & prevention, deadlock avoidance (banker's algorithm)

Unit 7: Memory Management [10 hours, 10 marks]

Multiprogramming (with fixed partitions, relocation and protection). What is swapping and its basic concepts. Virtual Memory – Basic Concepts, Paging, Page Tables, Page replacement algorithms: - Optimal, Not Recently Used, First In First Out, Least Recently Used

Unit 8: File System [10 hours, 8 marks]

What is file, file naming, file types(directory, regular, device), sequential access and random access files, file attributes, operations on file, hierarchical directory structure, path name(relative and absolute), operation on directories. File System Implementation Techniques.

Unit 9: I/O Management [10 hours, 7 marks]

Basic principles I/O Hardware, I/O Devices, Device controllers, DMA, Principles of I/O Software, its goals, Interrupt Handlers, Device Drivers, Device Independent I/O Software(its functions)

Unit 10: Protection [6 hours, 5 marks]

Needs for protection, domain of protection, Example in UNIX, access matrix, Implementation of Access matrix

Unit 11: Security [6 hours, 6 marks]

The security problem, Authentication, Password, password vulnerabilities, Encrypted password, One time password(OTP), Biometrics and its types, Program Threats : Trojan Horse, Trap door, System Threats: Worms, viruses, Denial of services, Intrusion detection(definition only), cryptography

Unit 12: Multiprocessor Systems [8 hours, 6 marks]

Multiprocessor Interconnections, types of Multiprocessor Operating Systems, Multiprocessor OS Functions and Requirements, Multiprocessor synchronization

Unit 13: Distributed Operating Systems [8 hours, 5 marks]

Algorithms and Distributed Processing, Coping with Failures Models of Distributed systems, Remote procedure calls, distributed Shared Memory, Distributed File Systems.

Unit 14: Multiprogramming system [6 hours, 5 marks]

Queue management, I/O supervisors, memory management. File system, disk and drum scheduling.

Unit 15: Advanced Topics [5 hours, 5 marks]

Secondary storage management

**MCA (S3) 12: Design and Analysis of Algorithm
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Introduction to Algorithms [6 hours, 10 marks]

Algorithm, analysis, time complexity and space complexity, O-notation, Omega notation and Theta notation, Sets and disjoint set, union and find algorithms. Sorting in linear time

Unit 2: Divide and Conquer [10 hours, 10 marks]

Divide and Conquer: General Strategy, Exponentiation, Binary Search, Quick Sort and Merge Sort.

Unit 3: Recurrences [8 hours, 6 marks]

Introduction, Substitution method, Recursion tree method, Master method, master theorem

Unit 4: Heap sort [7 hours, 7 marks]

Introduction, Heap, Maintaining heap property, Building a heap, Heapsort algorithm, counting sort

Unit 5: Medians and order statistics [6 hours, 5 marks]

Introduction, Minimum and maximum, Selection in expected linear time, selection in worst case linear time

Unit 6: Advance data structure [8 hours, 8 marks]

B Tree, Definition of B tree, minimum degree, height of B tree, Basic operations on B tree: Searching, inserting a key into a B tree, Splitting a node, Deleting a key from a B tree

Unit 7: Binomial Heaps [8 hours, 5 marks]

Introduction, Binomial tree and heap, Binomial heap properties, creating Binomial heap, Union of two Binomial, Extracting the node with minimum key, Deleting key

Unit 8: Fibonacci Heaps [8 hours, 5 marks]

Introduction, Fibonacci heap, Fibonacci heap properties, creating Fibonacci heap, Union of two Fibonacci heap, Extracting the node with minimum key, Deleting key

Unit 9: Greedy Method [10 hours, 10 marks]

General Strategy, Knapsack problem, Job sequencing with Deadlines, Optimal merge patterns, Minimal Spanning Trees and Dijkstra's algorithm

Unit 10: Amortized Analysis [8 hours, 5 marks]

Introduction, Aggregate analysis, Accounting method, Potential method, Dynamic tables, Table expansion

Unit 11: Dynamic Programming [10 hours, 10 marks]

General Strategy, Multistage graphs, OBST, 0/1 Knapsack, Traveling Salesperson Problem, Flow Shop Scheduling

Unit 12: Backtracking [9 hours, 8 marks]

Backtracking: General Strategy, 8 Queen's problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack

Unit 13: Branch and Bound [9 hours, 8 marks]

General Strategy, 0/1 Knapsack, Traveling Salesperson Problem

Unit 14: Single source shortest Path [8 hours, 6 marks]

Introduction, optimal substructure of a shortest path, Negative weight edges, cycles, representing shortest path, The Bellman-Ford algorithm, Dijkstra's algorithm

Unit 15: P, NP-HARD AND NP-COMPLETE PROBLEMS [5 hours, 5 marks]

Basic concepts, non-deterministic algorithms, NP-HARD and NP-COMPLETE classes, COOKS theorem

**MCA (S4) 13: Advanced Database Management System
DETAILED SYLLABUS**

4 credits: 120 hours of learning**Unit 1: File Structure [8 hours, 6 marks]**

Record storage and primary file organization: memory hierarchies and storage devices, Storage of Databases, Placing file records on disks: Records and its Types, Files, Fixed length records and variable length records, Record Blocking, allocating file blocks on disks, operation on files. Issues in Physical Design: Concept of indexes

Unit 2: Introduction to Database System [8 hours, 7 marks]

Database, DBMS, Characteristics of DBMS, Merits and Demerits of DBMS, Database Architecture: 3-tier Architecture of DBMS (its advantages over 2-tier), Data Independence, DBMS language, Types of DBMS, Database Administrator, Data Models;

Unit 3: Database Design using ER Model [8 hours, 6 marks]

Entities, Relationships, Representation of Entities, Attributes, Relationship Attributes, Relationship Set, Generalization, Aggregation, Structure of Relational Database and different types of Keys, Expressing M: N relation

Unit 4: Relational Model [10 hours, 10 marks]

Codd's rules, Relational Data Model & Relational Algebra, Relational Model Concept, Relational Model Constraints, Relational Algebra, Relational Calculus

Unit 5: Introduction to SQL [7 hours, 5 marks]

SQL, Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands

Unit 6: Elements of SQL [15 hours, 12 marks]

SQL operators and their procedure, Tables, Views and Indexes, Queries and Sub Queries, Aggregate Functions, Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus.

Unit 7: Relational Database design [10 hours, 10 marks]

Database Design – ER to Relational model, Functional dependencies, Normalization, Normal forms based on Primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF), Loss less joins and dependency, preserving decomposition

Unit 8: Object oriented database [8 hours, 6 marks]

Introduction, Object oriented concept, Object identity, Object structure, Specifying object behavior via class operations, Type hierarchies and Inheritance

Unit 9: Database System Architecture [6 hours, 5 marks]

Introduction, Client Server Architecture, Catalogs for Relational DBMSs, Data dictionary,

Unit 10: Transaction Processing Concepts [8 hours, 6 marks]

Introduction to transaction processing; transaction and system concepts; desirable properties of transaction; characteristics schedule based on recoverability; characteristics schedule based on serializability

Unit 11: Query processing and Optimization [7 hours, 6 marks]

Introduction, Translating SQL Queries into Relational Algebra, Implementing SELECT operations, Implementing JOIN operations, , Implementing PROJECT operations, Overview of Query optimization

Unit 12: Concurrency Control [7 hours, 6 marks]

Two phase locking techniques for concurrency control; Concurrency control based on time stamp ordering; multi-version concurrency control techniques; Validation concurrency control techniques; granularity of data items and multi granularity locking.

Unit 13: Database Recovery Techniques [6 hours, 5 marks]

Introduction, Categorization of Recovery algorithm, Caching of Disk Block, Write-Ahead Logging, Transaction Rollback, Shadow Paging, ARIES recovery algorithm

Unit 14: Security and Privacy [6 hours, 5 marks]

Database security issues, Discretionary access control based on grant & revoking privilege, Mandatory access control and role based access control for multilevel security, Encryption & public key infrastructures.

Unit 15: Distributed Databases [6 hours, 5 marks]

Introduction, Parallel versus Distributed Technology, Advantages of distributed databases, Data Fragmentation, Replication, and Allocation techniques, Types of Distributed Databases Systems, Distributed query processing

**MCA (S4) 14: MANAGEMENT ACCOUNTING
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Introduction to Management Accounting [8 hours, 5 marks]

Meaning, Objectives, Nature and Functions of Management Accounting; Differences between Cost Accounting and Management Accounting; Differences between Financial Accounting and Management Accounting; Management Accounting Techniques

Unit 2: Financial Statement Analysis [8 hours, 6 marks]

Meaning, features, importance and limitations of Financial Statement; Types of Financial Statement; Analysis and Interpretation of Financial Statement

Unit 3: Accounting Ratios [6 hours, 5 marks]

Meaning and Importance; Types of Ratios; Advantages and Limitations of Ratio Analysis

Unit 4: Fund Flow Statement [8 hours, 8 marks]

Meaning, Objectives, Advantages and Disadvantages of Fund Flow Statements, Preparation of Fund Flow Statement

Unit 5: Cash Flow Statement [8 hours, 8 marks]

Meaning, Objectives, Advantages and Disadvantages of Cash Flow Statements; Distinctions between Cash Flow Statement and Fund Flow Statement; Preparation of Cash Flow Statement

Unit 6: Budget and Budgetary Control [10 hours, 8 marks]

Meaning of Budget and Budgetary Control; Objectives, Advantages and Disadvantages of Budgetary Control; Essentials of Successful Budgetary Control; Classification of Budgets: Fixed, Flexible, Zero based, Programme and Performance Budgets.

Unit 7: Standard Costing [8 hours, 7 marks]

Concept of Standard Cost and Standard Costing; Advantages, Limitations and Applications of Standard Costing

Unit 8: Variance Analysis [8 hours, 7 marks]

Concept of Variance Analysis: Material, Labour, Overheads and Sales Variances; Disposition of Variances; Control Ratios.

Unit 9: Marginal Costing [7 hours, 7 marks]

Meaning, Advantages and Limitations of Marginal Costing; Applications of Marginal Costing

Unit 10: Break- Even Analysis [10 hours, 8 marks]

Meaning of Marginal Costing, Concept of Break Even Analysis, Practical uses of Break Even Analysis, Concept, of P.V. Ratio, Meaning of Margin of Safety, Meaning of Angle of Incidence; Break- Even Chart.

Unit 11: Cash Management [10 hours, 9 marks]

Nature of Cash; Motive for Holding Cash; Cash Management; Determining Optimum Cash Balance; Cash Management Models; Investment of Surplus Funds. Meaning of Receivable; Cost of Maintaining Receivables; Factors influencing Size of Receivables; Meaning and Objectives of Receivables Management; Dimension of Receivables Management

Unit 12: Receivable Management [6 hours, 5 marks]

Meaning of Receivable; Cost of Maintaining Receivables; Factors influencing Size of Receivables; Meaning and Objectives of Receivables Management; Dimension of Receivables Management

Unit 13: Human Resource Accounting [8 hours, 6 marks]

Meaning; Basic Premises of Human Resource Accounting; Need, Objectives and Advantages of Human Resource Accounting; Methods of Human Resource Accounting; Human Resource Accounting in India; Objections against Human Resource Accounting.

Unit 14: Accounting for Price level changes [8 hours, 6 marks]

Meaning, Need, Objectives and Advantages of Accounting for Price Level Changes; Methods of Accounting for Price Level Changes; Simple Problems

Unit 15: Contemporary Issues [7 hours, 5 marks]

Responsibility Accounting: Concept, Significance, Different Responsibility Centres; Divisional Performance Measurement: Financial and Non-Financial measures; Transfer Pricing.

**MCA (S4) 15: SYSTEM SOFTWARE
DETAILED SYLLABUS**

4 credits: 120 hours of learning

Unit 1: Introduction to System Software [4 hours, 4 marks]

Definition and classification of system software

Unit 2: Machine Structure and machine languages [6 hours, 5 marks]

Introduction, General machine structure, Data, Instruction, Machine language, Address modification

Unit 3: Assemblers [8 hours, 6 marks]

Assembly language, Assembly process, Data structures, Macros and macro processors

Unit 4: Linkers and loaders [10 hours, 8 marks]

Basic concepts, Static and dynamic linking, shared libraries, loaders, overlays. Case study of the UNIX linking system, Windows DLLs, OLEs

Unit 5: Programming languages [8 hours, 7 marks]

Introduction, Importance of high-level languages, Features of High level languages, Data types and data structure, block structure

Unit 6: Macro language and the macro processor [7 hours, 6 marks]

Introduction, Features of Macro facility, Macro Calls within Macros

Unit 7: Introduction to compiler [10 hours, 10 marks]

Introduction: Types of compiler, Phases of a compiler, Languages and grammar, Chomsky hierarchy

Unit 8: Lexical Analysis [10 hours, 8 marks]

The role of lexical analyzer, Signification of tokens, recognition of tokens, Finite automata, Lexical analyzer, Lexical analyzer generator (LEX)

Unit 9: Syntax Analysis [10 hours, 10 marks]

The role of Parser, context free grammar, Top-down and Bottom-up parsers, shift-reduce parser, operator precedence parsing, LL(1), LR parsers, Parser generator (YACC).

Unit 10: Syntax Directed Translation [9 hours, 8 marks]

Syntax directed definition, Construction of syntax tree, Top-down and bottom-up translation, recursive evaluators.

Unit 11: Semantic Analysis [8 hours, 6 marks]

Introduction, Type theory, Impact of type theory, Type checking: Static and dynamic, strong and weak, Type inference, Type conversion.

Unit 12: Code Generation [8 hours, 6 marks]

Intermediate code generation: intermediate languages, declarations, assignment statements; code generator, runtime storage management; Basics code optimization techniques.

Unit 13: Code Optimization [9 hours, 6 marks]

Introduction, Types of optimization, Factors Affecting optimization, problems of optimization, Data flow analysis, Loop optimization, Data Flow optimization, Functional Language Optimization.

Unit 14: Symbol Table [6 hours, 5 marks]

Introduction, Operation on symbol table, Symbol Table Implementation, Data structure for symbol table

Unit 15: Error detection and recovery [7 hours, 5 marks]

Introduction, Error representation, sources of errors, Lexical Phase errors, Syntax error detection and recovery

**MCA (S4) 16: PROGRAMMING IN JAVA
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Introduction to JAVA [5 hours, 4 marks]

An overview of JAVA, Basic features of Java, JAVA Environment, Installing the Java SDK, Writing Java Programs

Unit 2: Operators and Assignments [8 hours, 5 marks]

Introduction, Assignment operator, Comparison Operators, Instance of Comparison, Arithmetic operators, Shift operator, Bitwise operator, Logical operator, bitwise operator, conditional operator, casting.

Unit 3: Programming Basic [8 hours, 7 marks]

Java Token & Keywords, Constants, Data types; Declaring a variable, The scope and lifetime of variable, Various Operators, Input/Output statements Decision Making and Control Statements : if statement, If-else, else-if, switch statement; for, while, do-while statements

Unit 4: Class in Java [9 hours, 8 marks]

Class fundamentals: Defining class, Accessing class members, Declaring objects, Passing Arguments to Methods, Returning Multiple Values from methods, Modifiers

Unit 5: OOP in Java [10 hours, 6 marks]

Class fundamentals: Defining class, Accessing class members, Declaring objects, Constructors, copy constructor; Passing Arguments to Methods, modifiers, Inheritance: the super class, Multilevel Inheritance, Final and abstract keyword, Static Members

Unit 6: Arrays, Strings and Vectors [8 hours, 8 marks]

Declaring Arrays, Creating Arrays, Initializing Arrays, Multi-Dimensional Arrays, Strings: string arrays, string methods, String Buffer class, Vectors

Unit 7: Interfaces and Packages [8 hours, 6 marks]

Interfaces: Defining an Interface, Implementing interfaces, Applying Interfaces, Packages: Defining a package, Accessing and Importing Packages

Unit 8: Threads [8 hours, 6 marks]

Introduction, new threads, creating new threads by extending the thread class, creating a thread by implementing Runnable Interface, Threads in the Running State, Sleeping and Interruptions, Signaling with wait, notify

Unit 9: The java.lang.Math class [8 hours, 5 marks]

Introduction, Methods of the java.lang.Maths: abs, ceil, floor, max, min, random, round, sin, cos, tan, sqrt, exp, log, pow

Unit 10: Exception Handling [8 hours, 8 marks]

Exception Handling fundamentals, Exception types, Using *try* and *catch*, built-In exceptions in Java, User-defined exception

Unit 11: File Handling [8 hours, 7 marks]

I/O Basics: Streams, The Stream classes, The predefined streams, Reading console input, Writing console output, Reading and writing files

Unit 12: Introduction to Applets [8 hours, 8 marks]

Applets and the World Wide Web, The Applet Class, Applets and HTML , The Life Cycle of an Applet, Using Window Components, Event Handling, Adding Audio and Animation

Unit 13: AWT and Swings [8 hours, 8 marks]

AWT Basics, AWT Components, Event Handling, Application and Menus; Introduction to Swings, Swing Components, Event Handling, Display text and image in a window, Layout manager

UNIT 14: Introduction to JDBC [8 hours, 7 marks]

Basic steps to JDBC, API, JDBC Drivers, Connection Management, JDBC Design Considerations, Two Tier and Three Tier client server model, ResultSet, Prepared statement and callable statement, ResultSet Meta Data Object.

Unit 15: Database programming using Java [8 hours, 7 marks]

Keeping MySQL or NoSQL as backend and using java as front end good GUI should design to insert, update and delete record on a database table

MCA (S5)17: Software Engineering
DETAILED SYLLABUS
4 credits: 120 hours of learning

Unit 1: Introduction to Software Engineering [6 hours, 5 marks]

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes

Unit 2: Software Development Life Cycle (SDLC) Models [10 hours, 10 marks]

Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models

Unit 3: Software Project Management [10 hours, 10 marks]

Software Project Manager, Project Planning, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Project Estimation Techniques, Empirical method of Estimation, Heuristic method of Estimation- COCOMO Model, Analytical method of Estimation, Risk Management, Configuration Management.

Unit 4: Staffing and Scheduling [6 hours, 5 marks]

Staffing, Cost Estimation, Scheduling, Work Breakdown Structure, Activity Networks, Critical Path, Gantt Charts, PERT Charts

Unit 5: Role of System Analyst [6 hours, 5 marks]

System Analyst, Knowledge and Qualities of System Analyst, Role of a System Analyst.

Unit 6: Requirement Analysis and Specification [10 hours, 8 marks]

Fact Gathering, Requirement Analysis, Feasibility Study and Types, User Transaction Requirement, User Design Requirements, System Requirement Specification (SRS), Functional Requirements of SRS, Organization of SRS, IEEE Standards for SRS

Unit 7: Software Design [10 hours, 8 marks]

Modules Concepts and Types of Modules, Structured Chart, Qualities of Good Design: Coupling, Types of Coupling, Cohesion, Types of Cohesion, Approaches to Software Design, Function-Oriented Design, Object-Oriented Design

Unit 8: Function-Oriented Software Design [6 hours, 7 marks]

Entity-Relationship Diagrams, Decision Tree and Decision Table, Data Flow Diagrams (DFD), Data Dictionary :Elements of DD, Advantage of DD; Pseudo code, Input And Output Design.

Unit 9: Object-Oriented Software Design [6 hours, 7 marks]

Unified Modeling Language (UML), UML Diagrams, Use Case Model, Class Diagrams, Activity Diagrams

Unit 10: User Interface Design [10 hours, 5 marks]

Characteristics of a Good User Interface, Basic Concept: User Guidance and Online Help, Modeless Interface, Graphical User Interface (GUI) vs. Text-based User Interface, Types of User Interfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology

Unit 11: Software Coding [8 hours, 5 marks]

Coding, Coding Standards and Guidelines, Code Review: Code Walkthrough, Code inspection, Clean room testing, Software Documentation, Internal Documentation, External Documentation

Unit 12: Software Testing [8 hours, 10 marks]

Testing Objectives, Software Testing, Testing Strategies, Unit Testing, Integration Testing Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Stress Testing, Storage Testing, Performance Testing, Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit 13: Software Reliability and Quality Management [10 hours, 5 marks]

Software Reliability, Hardware versus Software Reliability, Reliability Matrics, Reliability Growth Modelling, Statistical Testing, Software Quality, Software Quality Management System, Evolution of Quality Systems, Product Metrics versus Process Metrics, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model

Unit 14: Software Maintenance [7 hours, 5 marks]

Software Maintenance, Software as an Evolutionary Entity, Need for Maintenance, Types of Software Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Software Reverse Engineering, Software Risk Analysis and Management

Unit 15: Case Tools [7 hours, 5 marks]

Introduction to CASE, Building Blocks of CASE, Integrated CASE Environment, Software Configuration Management Activities, Change Control Process, Software Version Control

MCA (S5) 18: Formal Languages and Automata**DETAILED SYLLABUS**

4 credits: 120 hours of learning

Unit 1: Mathematical Preliminaries [6 hours, 5 marks]

Set, Relations and Functions, Properties of relations, Closure of relations, Pigeon-hole principle, Strings and their properties, Principle of induction.

Unit 2: Introduction to Finite Automata [8 hours, 8 marks]

Introduction to Finite Automata; The central concepts of Automata theory; Transition system, Deterministic finite automata; Nondeterministic finite automata

Unit 3: Finite Automata and Regular Expressions [10 hours, 9 marks]

An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions

Unit 4: Regular Languages and Properties of Regular Languages [10 hours, 9 marks]

Regular expression, Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata

Unit 5: Formal languages [8 hours, 8 marks]

Basic definition, definition of a grammar, Derivation and language generated by a grammar, Chomsky classification of languages

Unit 6: Context-Free Grammars and Languages [8 hours, 6 marks]

Context –free grammars; Derivation tree, Parse trees; Applications; Ambiguity in grammars and Languages

Unit 7: Normal form for CFG [9 hours, 8 marks]

Introduction, Chomsky normal form, Reduction to Chomsky normal form, Greibach normal form, Pumping lemma for CFL

Unit 8: Pushdown Automata [10 hours, 8 marks]

Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata

Unit 9: Parsing and PDA [10 hours, 8 marks]

Introduction, Top Down Parsing, Construction of Top Down parser, Top Down parser using deterministic PDAs, Bottom Up Parsing

Unit 10: Properties of Context-Free Languages [7 hours, 5 marks]

Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFL

Unit 11: Introduction to Turing Machine [8 hours, 6 marks]

Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers

Unit 12: Undecidability [7 hours, 5 marks]

A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem; other undecidable problems

Unit 13: LR(k) grammar [7 hours, 5 marks]

Introduction, derivation tree, Properties of LR(k) grammar

Unit 14: Computability [6 hours, 5 marks]

Introduction, Initial functions Primitive recursive functions over {a,b}, Recursive functions, Partial recursive function.

Unit 15: Proposition and predicates [6 hours, 5 marks]

Introduction, Connectives, Negation, Conjunction, Disjunction, Implication, Truth table, Logical Identities

**MCA (S5) 19: Data Communication and Computer Networks
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Introduction to Data Communication [5 hours, 5 marks]

Introduction, Signals, Types of Signal: Analog, Digital, Block representation of Data Communication System, Definition of Protocols and Standards, Channel, Bandwidth, SNR

Unit 2: Types of Data Communication [5 hours, 5 marks]

Data Communication, Parallel and Serial Communication, Modes of Communication: Simplex, Half Duplex, Full Duplex; Asynchronous and Synchronous Communication

Unit 3: Digital Transmission Fundamentals [8 hours, 7 marks]

Digital Signal (PCM, Delta Modulation, Adaptive Delta Modulation, ASK, PSK, FSK), Multiplexing and De-multiplexing, Detection and Correction of Transmission Errors (Parity and Hamming Code Technique), Data Compression and Encryption, Concept of BCH Coding

Unit 4: Introduction to Computer Networks [8 hours, 8 marks]

Computer Network: Definition, Goals, Structure; Broadcast and Point-To-Point Networks; Types of Networks (LAN, MAN, WAN: Server Based LANs & Peer-to-Peer LANs), Network Topologies, Network Protocols and Standards, Networking Switching Techniques

Unit 5: Network Models [6 hours, 7 marks]

Network Reference Models, Design Issues of the Layer, Protocol Hierarchy, ISO-OSI Reference Model: Functions of each Layer, TCP/IP reference Model, Comparison of ISO-OSI and TCP/IP Model, Various Terminology used in Computer Network

Unit 6: Physical Layer [8 hours, 7 marks]

Physical Layer, Data rate limits, Transmission impairment, Signal measurements like throughput, propagation speed and time, wave length; Digital Transmission: Line coding, block coding, sampling, transmission mode; Analog Transmission: Modulation digital data, telephone modem, Modulation analog signals; Multiplexing: FDM, WDM, TDM; Transmission Media:

Guided media, Unguided media, Circuit Switching and Telephone Network: Circuit switching, telephone network;

Unit 7: Data Link Layer [10 hours, 7 marks]

Data Link Layer, Flow Control, Access Protocol, Bridges and Switches, MAC, LLC, Frame, Frame Format, Error Detection and Correction: Type of errors, detection and correction of errors; Data Link Control and Protocol: Flow & error control, Stop-And -Wait ARQ, Go-Back-N ARQ, Select Repeat ARQ, HDLC; Point-To-Point Access: Point-to-point protocol, PPP stack; Local Area Network: Traditional Ethernet, fast and gigabit Ethernets; Connecting LANs, Backbone Networks and Virtual LANs: Connecting devices, Backbone networks, Virtual LANs;

Unit 8: Network Layer [10 hours, 7 marks]

Network Layer, Routing Protocols, Internet Protocol, IP Addresses, Sub-netting, Connection-Oriented & Connectionless Services, Internetworks, Addressing, Routing, Network Layer Protocols: ARP, IP, ICMP, IPV6, Unicast routing, Unicast routing protocols, Multi routing, Multicast routing protocols;

Unit 9: Transport Layer [8 hours, 7 marks]

Process-To-Process delivery, User Datagram Protocol, Transmission Control Protocol: Characteristics, TCP Segment, Connection Establishment and termination

Unit 10: Session Layer [8 hours, 5 marks]

Interhost communication; Services- Dialog control, Token management, Synchronization; Protocols- Remote Procedure Call (RPC), NETBIOS.

Unit 11: Presentation Layer [8 hours, 5 marks]

Services - Data conversion, Translation, Encryption, Compression; Protocols - FTP, Telnet.

Unit 12: Application Layer [8 hours, 7 marks]

Client-Server Model: Client-Server model, Socket interface; A brief introduction to DNS, SMTP, FTP

Unit 13: Fundamentals of TCP and UDP [10 hours, 8 marks]

Connectionless and Connection Oriented Protocol, Transmission Control Protocol (TCP), User Datagram Protocol (UDP), IDP

Unit 14: Network Standard Protocol and Network Devices [10 hours, 10 marks]

FTP, Telnet, HTTP, Email Protocol, POP, SMTP, Browser, WWW, PING, Remote Login, Socket, Gateway, Bridge, Hub, Switch, RS-32C, Network Interface Card (NIC), Network Adapters, Components of NIC, Functions of NIC, Types of NIC; Ethernet: Basic Features, Types of Ethernet, Different Framer Format: IEEE 802.3, IEEE 802.4, IEEE 802.5

Unit 15: Wireless LANs [8 hours, 5 marks]

Wireless LANs (IEEE 802.11), Architecture, MAC Sub Layer, Frame Format, Frame Types, PSTN, Satellite Network

MCA (S5) 20 A: Linux System Administration
ELECTIVE-I
DETAILED SYLLABUS
4 credits: 120 hours of learning

Unit 1: Introduction to System Administration [6 hours, 5 marks]

Introduction to System Administration, Role of System Administrator, Qualities of good System Administrator, System Administration Common administrative tasks, identifying administrative files – configuration and log files,

Unit 2: Introduction to LINUX Operating System [7 hours, 5 marks]

Basic idea on Proprietary, Open Source, Free Software etc, Basic Features of the Linux operating system, Introduction of Various Linux Distribution (Red Hat Enterprise Linux, Cent OS, Fedora Projects, Debian Linux, Ubuntu, SUSE etc.);

Unit 3: Installation of LINUX Operating System [10 hours, 5 marks]

Installation Requirements, Partitioning the Hard drive in Linux, Installing the Linux system: Using Live CD, Virtual Machine, Direct Installation, Installing and Configuring software in Linux

Unit 4: LINUX Kernel [10 hours, 8 marks]

Linux kernel and device drivers, System Startup and Shutdown, Standard I/O, Standard error, Redirection and Piping

Unit 5: Basics of LINUX File System [8 hours, 7 marks]

Basics of Linux file system - File system types (ext3, ext4, xfs, jfs, ReiserFS, iso9660 etc.), Boot block, Super block, Inode table, Data blocks, How Linux access files, storage files, Linux standard directories, LILO, GRUB Boot Loader, three basic types of files (ordinary or regular, special or device and directory), I-nodes and file attributes, init and run levels

Unit 6: File organization [7 hours, 8 marks]

Files and File System (File Types and Permissions, Links, Size and Space, Date and Time); Working with Files: Reading Files, Searching for files, Copying, Moving, Renaming, Deleting,

Linking, and Editing Files; Absolute and Relative path names, File system Mounting and Unmounting, Organization of the file tree, Standard directories and their contents, Disk related commands, checking disk free spaces.

Unit 7: LINUX File Handling Commands [8 hours, 7 marks]

Files and Directory handling Commands - ls, cd, cp, mv, rm, mkdir, rmdir, pwd, Commands for Creating and Viewing ordinary files – cat, more, less, pg

Unit 8: LINUX Filter Commands [8 hours, 8 marks]

Filter Commands – wc, head, tail, cut, tr, top, grep (with regular expressions),. Other commands –tar, unzip, nice, kill, netstat. Setting user and group ownership of files and Access permissions – chmod, chown, chgrp commands

Unit 9: LINUX Shells [10 hours, 8 marks]

Various types of Shell available in Linux, Comparisons between various Shells, Study of different Linux Shells (sh, bash, csh, zsh), Environment variables, Shell script basics (examples of some simple shell programming), Shell programming in bash, read command, conditional and looping statements, case statements, parameter passing and arguments, Shell variables, system shell variables, shell keywords, creating Shell programs for performing various tasks.

Unit 10: Process [7 hours, 7 marks]

Services and Process, Basic commands for starting and stopping processes, Basic process attributes and their role in Access control. Examining the list of running processes on the system and understand the data presented there. Background process, Job control, Crontab file format, Backup and Restore procedure

Unit 11: Printing Jobs [5 hours, 4 marks]

Submit a print job, check the status of a print job, cancel a print job, configuring the Print Queue, Selecting the Print Driver, Editing the Printer configuration

Unit 12: System Administration Tasks [10 hours, 8 marks]

Getting Started: Login process, Creating Users Account and Group, Getting Help, Understanding the “root” account, Managing user accounts-adding, modifying and removing User accounts, changing permissions and ownerships, Creating and managing groups, modifying group attributes, becoming super user using su; limited su (sudo) Changing Password, System monitoring and logging, Monitoring memory usage, disk space usage and I/O activity, Temporary disable user’s accounts, creating and mounting file system, checking and monitoring system performance file security & Permissions, Getting system information with uname, host name, disk partitions & sizes, users, kernel. Backup and restore files, reconfiguration hardware

with kudzu, installing and removing packages in Linux. Configure X-windows starting & using X desktop. KDE & Gnome graphical interfaces, changing X windows settings.

Unit 13: Networking in LINUX [8 hours, 7 marks]

Installation and configuration of a simple LAN; Installation and configuration of: Proxy server(Squid), DNS server(BIND), Mail server, Web server(Apache), File server(Samba), DHCP server; Installation and configuration of a SSH server and client; Installation and configuration of FTP server and client, rules governing IP address classes and netmasks, Network Address, Netmask and Gateway configuring Interface with ifconfig, ping, netstat, traceroute, telnet, understanding the significance of the /etc/services file and well known port numbers

Unit 14: Network Protocols [8 hours, 7 marks]

Basics of configuring NFS, NIS, DNS, FTP, Squid Proxy, DHCP server, ip tables and firewall

Unit 15: Basic Network Security Issues [8 hours, 6 marks]

Introduction to Basic Network Security Issues, Packet Sniffers, DOS Attacks, Linux Kernel Firewalling, Virtual Private Networks

MCA (S6) 20 B: Image Processing (Total Marks: 50+10+40)

4 credits: 120 hours of learning

Unit 1: Fundamental of image [6 hours, 5 marks]

Definition of image, Analog image, digital image, Advantages & disadvantages of digital image, digital image representation, pixel, neighbours of pixel

Unit 2: Image Sampling [6 hours, 5 marks]

Introduction, Theory of 2D sampling, violation of sampling criterion, quantization, Resolution, Anatomy of the human visual system

Unit 3: Digital Image [8 hours, 8 marks]

Classification of digital image : Raster image, vector image, Image types : Binary image, grayscale image, color image, multispectral image, hyper spectral image, Elements of image processing system : Image sensor, acquisition, CCD sensor, CMOS image sensor comparison of CCD and CMOS sensors, Digital camera, Image file format, GIF file format, JPEG, PNG, TIFF, PSD, EPS, BMP, Application of digital image processing

Unit 4: Image Transform [10 hours, 8 marks]

Introduction, need for transform, Image transform, classification of image transform ,Fourier transform, 2D discrete Fourier transform, Properties of 2D DFT: Separable, spatial shift property, periodicity, convolution, correlation properties, scaling property, rotation property

Unit 5: Image enhancement in spatial domain [10 hours, 7 marks]

Introduction, Image enhancement in spatial domain: point operation, mask operation, Types of point operation: Brightness modification, contrast adjustment

Unit 6: Image Histogram [6 hours, 5 marks]

Introduction, histogram equalization, procedure to perform histogram equalization

Unit 7: Filtering [8 hours, 8 marks]

Introduction, Spatial filtering, linear filtering, low pass filter, limitations of low pass filter, weighted average filter, Bartlett filter, Gaussian filter, Median filter, High pass filtering

Unit 8: Image enhancement in frequency domain [8 hours, 6 marks]

Introduction, Low pass filtering in frequency domain, High pass filter in frequency domain, Butterworth high pass filter, Homomorphic filter

Unit 9: Image Restoration [10 hours, 8 marks]

Introduction, Image degradation, Types of image Blur, Classification of Image Restoration technique, Image restoration model, Linear Image Restoration techniques, Pseudo Inverse filter, Wiener filter, Non Linear Image Restoration techniques : Iterative method, Maximum likelihood Method, Stochastic image restoration technique

Unit 10: Image noise [8 hours, 8 marks]

Introduction, classification of noise image: adaptive noise, Multiplicative noise, impulse noise, Median filtering, trimmed average filter

Unit 11: Image segmentation [10 hours, 8 marks]

Introduction, Classification of Image segmentation technique, Local and global segmentation, region approach to image segmentation, clustering technique, Image segmentation based on thresholding, Limitation, edge detection techniques, edge linking, Watershed transformation

Unit 12: Image compression [10 hours, 7 marks]

Introduction, Need for Image compression, Redundancy in images, Image compression scheme Huffman coding, Arithmetic coding, transform base coding, Vector quantization

Unit 13: Binary Image Processing [8 hours, 7 marks]

Introduction, Binarisation, Mathematical morphology, structuring element, Morphological image processing, Basic set theory, Logical operations, Standard binary morphological operations: Dialation, Erosion, Opening, Closing, Properties of Morphological operations

Unit 14: Color Image processing [6 hours, 5 marks]

Introduction, Color formation, Human perception of color, Color model: RGB model, CMY color model, HIS color model, YIQ color model, Histogram equalization of color image, Color Image filtering

Unit 15: Wavelet-based Image Processing [6 hours, 5 marks]

Introduction, Wavelet, Wavelet transform, 2D continuous wavelet transform, Discrete wavelet transform, Haar Wavelet, Filter bank, Embedded Image coding

MCA (S6) 21: Advanced Web Technology**DETAILED SYLLABUS****4 credits: 120 hours of learning****Unit 1: Basics of Internet and Web [5 hours, 5 marks]**

History of the Internet and the Web, The basics of Internet, World Wide Web Consortium (W3C), World Wide Web, Web page, Home page, Web site, Static, Dynamic and Active web page, Hypertext, hyperlink, Uniform Resource Locator (URL), Overview of Protocols – Simple Mail Transfer Protocol, Gopher, Telnet, Emails, FTP, Hyper Text Transfer Protocol (HTTP), Hypertext Transfer Protocol Secure (HTTPS), Client server computing concepts, MIME, Web Surfing, Domain Name System (DNS), TCP/IP the protocol of the Internet, Internet Protocol (IP) and the concept of IP Addresses. Internet Service Provider (ISP), Autonomous System (AS), Free and Proprietary Software

Unit 2: Web Client [5 hours, 5 marks]

Web Browser, Browsers e.g., Netscape navigator, Internet Explorer, Mozilla Firefox, Client-Side Scripting Languages- VB Script and Java Script, Active X control and Plug-ins

Unit 3: Web Sever [5 hours, 5 marks]

Web Server Architecture, Image maps, CGI, API web database connectivity-DBC, ODBC, Proxy Server

Unit 4: Introduction to HTML [7 hours, 7 marks]

Introduction to HTML, HTML and its components, Essential Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags (DIV, MARQUEE, NOBR, DFN, HR, LISTING, Comment, IMG), Color and Background of Web Pages, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Document Object Model (DOM), Creating a simple web page

Unit 5: HTML Lists and Tables [7 hours, 7 marks]

Lists, Unordered Lists, Ordered Lists, Definition Lists, Tables, TABLE, TR and TD Tags, Cell Spacing and Cell Padding, Colspan and Rowspan

Unit 6: HTML Frames and Form [7 hours, 7 marks]

Frame, 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

Unit 7: Cascading Style Sheet [10 hours, 7 marks]

Cascading Style Sheets (CSS), Inline Style, Embedded Style, External Style Sheet, Imported Style Sheet, Ruleset, @ rule, Class Selector, ID Selector, Contextual Selector, Attribute Selector, CSS Properties – background properties, text properties, border properties, Creating a CSS file, Using CSS in a web page

Unit 8: Dynamic HTML [10 hours, 7 marks]

Dynamic HTML, Document Object Model, Features of DHTML, CSSP (Cascading Style Sheet Positioning) and JSSS (JavaScript assisted Style Sheet), Layers of Netscape, The ID Attribute, DHTML Events.

Unit 9: Introduction to JavaScript [8 hours, 7 marks]

Introduction, Language Elements: Data types, Identifiers, Expressions, Operators, Statement Functions, JavaScript - Comments, document write(), console.log(), Variables, length, substring, Conditional Statements - if, Loops - for, Functions. Creating a JavaScript file, Using JavaScript in a Web page

Unit 10: Objects in JavaScript [8 hours, 7 marks]

Objects: Window, Document, Form Objects, TextBox, TextArea, Button, Radio Button, CheckBox, Select Objects, Date, Match, String Objects; Regular Expression, Arrays, HTML DOM and JavaScript - Finding HTML Elements, Changing HTML elements, DOM events,

Unit 11: AJAX Basics [10 hours, 7 marks]

Introduction, AJAX, XML http Request Object, AJAX Request, AJAX Response, AJAX Events, Adding Ajax Functionality in JavaScript, Adding Ajax Functionality to a Web Page

Unit 12: XML [10 hours, 8 marks]

XML - Declaration, Root Element, Child Elements, Element Attributes, Entity References, Comments

Unit 13: Introduction to PHP [10 hours, 8 marks]

Software Prerequisites - Installing Apache and PHP, Starting and Testing Apache, Testing PHP with phpinfo(), Installing MySQL, Starting and Testing MySQL, Installing the php-mysql Module, Checking the php-mysql Module

Introduction to PHP, Basic Programming Concepts of PHP: Variables, Data-types, Constants, Scope of Variables, Type of Variables, Type Casting, Operators, Operators Precedence, References, Connecting to MySQL using PHP, Building a Web Page using PHP

Unit 14: Control statements and Functions in PHP [10 hours, 8 marks]

Control Structures: Branching, If statement, Switch statement; Looping: for Loop, while Loop, do while Loop, for each Loop; Arrays, Functions: User Defined Functions, Built-in Function, Functions for Variables; Script Controlling Functions, Array Functions, Date and Time Functions, Mathematical Functions, String Functions, PHP Server Variables; Working with form, Uploading files to Web Server using PHP

Unit 15: Creating a Web Application – putting it all together [8 hours, 5 marks]

The MVC Design Pattern – Basic Web Architecture, MVC Architecture, Coding Considerations, Setting up our Development Environment, Building our MVC Framework, Building a PHP Application on our MVC framework

**MCA (S6) 22 A: Electronic Commerce
ELECTIVE-II
DETAILED SYLLABUS
4 credits: 120 hours of learning**

Unit 1: Introduction to Electronic Commerce [6 hours, 6 marks]

Definition of Electronic Commerce (E-Commerce), Need for E-Commerce, Scope of E-Commerce, Types of E-Commerce, Advantages of E-Commerce, Disadvantages of E-Commerce, Electronic Commerce Applications

Unit 2: The Internet and WWW [6 hours, 5 marks]

Evolution of the Internet, WWW and Domain Names, Registering a Domain Name, Internet Service Provider (ISP)

Unit 3: Internet Marketing [6 hours, 5 marks]

Building a Website – Reasons and Benefits, Web Promotion, Internet Marketing and its E-cycle, Pros and Cons of online shopping

Unit 4: Mobile Commerce [6 hours, 6 marks]

Definition of Mobile Commerce, Mobile Information Device, Mobile Computing Applications

Unit 5: Wireless Application Protocol [8 hours, 6 marks]

Wireless Application Protocol (WAP), WAP technology, Advantages and Disadvantages of WAP

Unit 6: Web Security Threats [10 hours, 9 marks]

Security Issues on Web, Secure Transaction, Computer Monitoring, Security threats and attack on Computer System, Hacking, Computer Virus, Different online security attacks while mobile or website shopping

Unit 7: Web Security Protection [10 hours, 9 marks]

Software Packages for Privacy and Protection, Privacy on Internet, Corporate Email Privacy, Importance of Firewall, Components of Firewall, Factors to consider Firewall design, Limitation of Firewalls

Unit 8: Encryption and Decryption [10 hours, 9 marks]

Encryption and Decryption Techniques, Symmetric Encryption- Keys and Data Encryption Standard (DES), Triple Encryption, Asymmetric Encryption- Secret Key Encryption, Public and Private pair key encryption

Unit 9: Internet Protection Techniques [8 hours, 6 marks]

Authorization and Authentication, Digital Signatures, Virtual Private Network

Unit 10: Intranet and Extranet [8 hours, 6 marks]

Definition of Intranet, Advantages and Disadvantages of the Intranet, Component of a Intranet, Development of Intranet, Extranet and Intranet Difference, Role of Intranet in B2B Application

Unit 11: Electronic Payment System [10 hours, 9 marks]

Overview of Electronic Payment, Traditional Payment, SET Protocol, Payment Gateway, Payment Types, Electronic Funds Transfer, Paperless Bill, Electronic Cash, Online Banking

Unit 12: EDI [8 hours, 6 marks]

Concepts of EDI, EDI Application in Business, Limitations of EDI, Indian Custom EDI system, Service Centre, Imports, Exports

Unit 13: E-Governance in India [8 hours, 6 marks]

Introduction to E- Governance, Status of E-Governance in India, Merits and Demerits, Limitations for E-Governance in India

Unit 14: Cyber Crime in E-Commerce Sector [8 hours, 6 marks]

Cyber Crime in E-Commerce Sector, Different types of e-commerce crimes, Famous Cases

Unit 15: Cyber Law in E-Commerce Sector [8 hours, 6 marks]

Cyber Law in India related to E-Commerce, How to file a complaint, Famous resolved e-commerce cases etc

MCA (S6) 22 B: Data Warehousing and Data Mining

(Total Marks: 80+20)

4 credits: 120 hours of learning

Unit 1: Introduction to Data mining [5 hours, 6 marks]

Data mining, various types of Data, Data Mining Functionalities, Classification of Data mining Systems, Data mining Task Primitives, Integration of Data Mining System, Major issues in Data Mining

Unit 2: Introduction to Data Warehousing [7 hours, 8 marks]

Data Warehouse and DBMS, The need for data warehousing, Operational & Informational Data Stores, Data Warehouse Characteristics, Building a Data Warehouse, Design/Technical/Implementation Considerations, Data Warehouse role & Structure, The cost of warehousing data

Unit 3: Introduction to OLAP [5 hours, 5 marks]

Introduction to OLAP & OLTP, Difference between OLAP & OLTP, OLAP Operations

Unit 4: Data preprocessing [6 hours, 5 marks]

Data preprocessing, Data Summarization, Data Cleaning, Data Transformation, Data reduction, Concept Hierarchy, Structure

Unit 5: Multidimensional Data [5 hours, 5 marks]

Multidimensional Data Model, Schemas for Multidimensional Data (Star Schema, Snowflake Schema, Fact Constellation)

Unit 6: Data Warehouse Architecture [10 hours, 8 marks]

Data Warehouse Architecture, Data Warehouse Design, OLAP Three -tier Architecture, Indexing & Querying in OLAP, OLAM, Implementation from Data Warehouse to Data mining

Unit 7: Data mining knowledge representation [10 hours, 7 marks]

Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques

Unit 8: Attribute-oriented analysis [10 hours, 7 marks]

Attribute generalization, Attribute relevance, Class comparison, Statistical measures

Unit 9: Association Rule mining [10 hours, 7 marks]

Association Rule Mining, Market Basket Analysis, Apriori Algorithm, Mining Multilevel Association Rules, From Association Mining to Correlation Analysis

Unit 10: Classification [10 hours, 8 marks]

Introduction to Classification, Classification by Decision Tree, Attribute Selection Measure, Covering rules

Unit 11: Prediction [10 hours, 8 marks]

Introduction to Prediction techniques, Statistical (Bayesian) classification, Bayesian networks, Instance-based methods (nearest neighbor)

Unit 12: Evaluation [10 hours, 8 marks]

Training and Testing, Evaluating accuracy of a Classifier, Cross-Validation, Combining multiple models (Bootstrap, Boosting, Bagging)

Unit 13: Clustering [10 hours, 10 marks]

Introduction to Clustering, Classification of Various Clustering Algorithms, Partitioning methods- k-means, Density based DB-SCAN, Hierarchical methods- agglomerative and divisive clustering

Unit 14: Introduction to Web Mining [6 hours, 4 marks]

Web Mining introduction, web content mining, web structure mining, web usage mining, text mining, unstructured text, episode rule discovery for text

Unit 15: Introduction to Spatial and Temporal Data Mining [6 hours, 4 marks]

Temporal Data Mining, Temporal Association Rules, Sequence Mining, Spatial Mining, Spatial Mining tasks, spatial clustering

MCA (S6) 23: Project

8 credits: 240 hours of learning

A. PROJECT GUIDE

Eligibility criteria:

Full Time Faculties in the Department of Computer Science/ Information Technology of KKHSOU/ Colleges/ Institutions affiliated to any Indian University recognized by UGC and having minimum 2 years teaching experience.

OR

A person having minimum M.Tech., MCA, M.Sc. in Computer Science/Information Technology from a UGC recognized universities with 4 years experience in Industry/teaching.

B. TYPE OF PROJECT

Learner may choose any topics according to MCA standards. Most of the project work falls under the following types

- a. Database oriented (e.g. payroll system, Loan management system etc.)
- b. Application oriented (e.g. Mobile apps development, web based development)
- c. R & D project (e.g. Image processing, speech processing, data mining, networking etc)

C. PROJECT PROPOSAL (SYNOPSIS)

The project proposal or the synopsis is the frame work for carrying out the project. It should be prepared in consultation with Guide. The necessary parts of a project proposal are given in the following form:

- * Title of the Project
- * Introduction and Objectives of the Project
- * Project Category (RDBMS/ Application/ R & D)
- * Tools, Platform, Hardware and Software Requirement specifications
- * Whether the project is done for any Industry/Client? The Name and Address of the Industry or Client is to be mentioned
- * Methodology
- * Expected output
- * Conclusion

D. APPLICATION AREAS & RELATED TOOLS

A list of selected area for developing the project work is given below:

APPLICATIONS : Financial/ Manufacturing/ Multimedia/ Computer Graphics/ Instructional Design/ Database Management System/ Internet/ Intranet/ Computer Networking- Communication Software/E-Commerce/TCP/IP Internals/ Routing protocols/ Implementation of Switches & Routers/ Image processing,/ Mobile apps development/ etc..

Related Tools:

FRONT END / GUI Tools : PhP, Scripting languages etc.

RDBMS/BACK END : Oracle, MYSQL, No SQL, DB2 etc.

LANGUAGES : C, C++, Java, VC++, C#, Matlab, Python, Scilab etc.

INTERNET TECHNOLOGIES : DHTML, Java script, VB Script, HTML, Java, Active X, SWING, JSP,ASP, PHP, XML, Java Beans, Java Servlets, CSS, VB.Net,AWT, J2EE.

NETWORKING TECHNOLOGIES : ATM, Frame Relay, TCP/IP, SNMP, GSM, VoIP, PPP, IP-PSTN, SONET/SDH

WIRELESS TECHNOLOGIES : BlueTooth, 3G, ISDN, EDGE

OPERATING SYSTEMS: WINDOWS/ DOS / UNIX / LINUX /ANDROID.

PROJECT REPORT GUIDELINE

The Project report should prepared in well structured preferably typed in Latex. Depending on the type of project the report should be as follows

Database project:

Acknowledgement

Content with page number

Declaration Certificate

Certificate from Guide

CHAPTER I: INTRODUCTION

- 1.1 Brief idea about the project
- 1.2 Objective of the project
- 1.3 Scope of the project
- 1.4 Existing system
- 1.5 Proposed System
- 1.6 Platform used(Hardware & Software)
- 1.7 Project location

CHAPTER II: REQUIREMENT ANALYSIS

- 2.1 Introduction
- 2.2 Tools used for Requirement gathering
- 2.3 Problem in Existing System
- 2.4 Conclusion

CHAPTER III: LOGICAL DESIGN

- 3.1 Introduction
- 3.2 DFD (0th, 1st, 2nd level)
- 3.3 ER diagram
- 3.4 Use case diagram
- 3.5 Activity diagram
- 3.6 Conclusion

CHAPTER IV: PHYSICAL DESIGN

- 4.1 Introduction
- 4.2 Database Design (Give your normalized database here)
- 4.3 Module design
- 4.4 Input/output design
- 4.5 Conclusion

CHAPTER V: IMPLEMENTATION

- 5.1 Introduction
- 5.2 Process description (if any)
- 5.3 Output & Report
- 5.4 Conclusion

CHAPTER VI: TESTING

- 6.1 Introduction
- 6.2 Types of testing performed
- 6.3 Conclusion

References

Appendix (if any)

R & D/ Application project:

Acknowledgement

Content with page number

Declaration Certificate

Certificate from Guide

CHAPTER I: INTRODUCTION

- 1.1 Brief idea about the project
- 1.2 Objective of the project
- 1.3 Scope of the project
- 1.4 Application of the project
- 1.5 Proposed System
- 1.6 Platform used(Hardware & Software)
- 1.7 Project location

CHAPTER II: LITERATURE REVIEW

- 2.1 Introduction
- 2.2 Work already done in the area (Historical evidence)
- 2.3 Problem in Existing technology
- 2.4 Conclusion

CHAPTER III: THEORITICAL BACKGROUND

- 3.1 Introduction
- 3.2 Theory used in the project
- 3.6 Conclusion

CHAPTER IV: RESULT AND DISCUSSION

- 4.1 Introduction
- 4.2 Methodology
- 4.3 Result

4.4 Analysis on result

4.5 Conclusion

CHAPTER V: Conclusion & Future work

6.1 Introduction

6.2 Chapter wise conclusion

6.3 Future work

References

Appendix (if any)

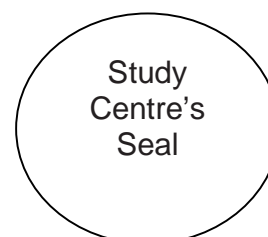
[Note: All project reports (soft copy) must send to Computer Science Department, KKHSOU in the following email address csc@kkhsou.in]

CERTIFICATE OF ORIGINALITY FROM THE GUIDE

This is to certify that the project report entitled submitted to **Krishna Kanta Handiqui State Open University** in partial fulfilment of the requirement for the award of the degree of **MASTER OF COMPUTER APPLICATIONS (MCA)**, is an original work carried out by Mr./Ms..... Enrolment No.: under the supervision of Dr./Mr./Ms..... The matter embodied in this project is a genuine work done by the student and has not been submitted either to this University or to any other University/Institute for the fulfilment of the requirement of any course of study.

Signature of the Learner

Signature of the Guide

Name
Address
Enrolment No.:Name
Designation
Address

FORMAT OF THE PROJECT REPORT

A Project Report on _____

Font type: Arial
Size: 12, Bold

TITLE OF THE PROJECT _____

Font type: Arial
Size: 16, Bold

**In fulfillment of the requirement for the 6th Semester of
Master of Computer Application
Programme**



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(Name of the Learner)
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Session:

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Under the Guidance of

.....
(Name of the Project Guide)

Study Centre

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(Name of the Study Centre)

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