SRI SANKARA ARTS & SCIENCE COLLEGE

(AUTONOMOUS)

ENATHUR, KANCHIPURAM

DEPATMENT OF COMPUTER SCIENCE

M.Sc DEGREE COURSE IN COMPUTER SCIENCE

(CHOICED BASED CREDIT SYSTEM)

REGULATIONS :

1. CBCS SYSTEM :

All programmes (named after the core subject) mentioned earlier shall be run on **Choice Based Credit System (CBCS).** It is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education

2. ELIGIBILITY FOR ADMISSION:

Candidates with B.Sc. degree in Computer Science or Computer Science & Technology or B.C.A. degree of this University or any other degree accepted as equivalent thereto by Academic Council of the Autonomous College shall be eligible for admission to M.Sc Computer Science Degree Course.

3. ELIGIBILITY FOR THE AWARD OF DEGREE

A Candidate shall be eligible for the award of the Degree only if he / she has undergone the prescribed course of study in a Autonomous College for a period of not less than two academic years, passed the examinations of all the Four Semesters prescribed earning 90 credits in Parts-I, II, III, IV & V and fulfilled such conditions as have been prescribed therefore. The parent university will award degrees to the students evaluated and recommended by autonomous colleges.

4. DURATION

Each academic year shall be divided into two semesters. The first academic year shall comprise the first and second semesters, the second academic year the third and fourth semesters respectively.

The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year. There shall be not less than 90 working days for each semester exclusive of the days for the conduct of semester examinations.

In each semester, Courses are administered in 15 teaching weeks and another 5 weeks are utilized for evaluation and grading purposes. Each week has 30 working hours spread over in a 5 day week. Depending upon the content and specialization, a paper may have 1 to 6 credits. Total number of teaching hours in a semester will be 450 hrs.

5. MAXIMUM PERIOD FOR COMPLETION OF THE PROGRAMMES

The candidates shall complete the Masters Degree Programmes within 4 years from the date of admission. The term completing the programmes means passing all the prescribed examinations of the programme to become eligible for the degree. No candidate shall be permitted to appear for the examinations after the prescribed period for completing the programme.

6. MEDIUM OF INSTRUCTION

The medium of instruction shall be English.

7. COURSE OF STUDY

A Master's programme consists of a number of courses (papers). The term Course is used to indicate logical part of a subject matter of the programme. In each of Master's programmes, there will be a prescription of (i) Part –I (Core subjects – Theory, Practicals, Project, and Field work), (ii) Part – II (Elective subjects – Inter disciplinary or Extra disciplinary subjects), (iii) Part – III: a set of papers recommended by UGC and TANSCHE (Soft skills), (iv) Part – IV: Internship, and (v) The detail of the Study for Master Degree Courses shall consist of the following:

PART – I Core Subjects – Theory, Practicals, Project / Field work PG students shall be required to take up Project / Field Work and submit the Project Report during the second year. The Head of the Department shall allot the Guide who in turn will suggest the Project Work to the students. Two typed copies of the Project Report shall be submitted to the Department before the due date and one copy will be forwarded to the Controller of Examinations. For the Project Report, the maximum

internal marks will be 20 percent, the maximum external marks will be 60 per cent and for the Viva-Voce 20 per cent (If in some programmes, if the project is equivalent to more than one paper, the project marks would be in proportion to the number of equivalent papers). Each student shall be required to appear for Viva-Voce Examination in defence of the Project only.

PART – II Elective Subjects – Inter-disciplinary or Extra-disciplinary or self study elective or open elective

PART – III Skill Based Subjects - Soft Skills

A candidate shall be eligible for the award of the degree only if he/she has undergone the prescribed papers on Soft Skills. For three years PG degree Programme, a candidate must undergo a minimum of 2 papers (2 x 2 = 4 credits). Papers will be finalized in due course.

PART – IV Internship

Each PG student shall appear for intenship training during the vacation of II Semester for a minimum period of 15 days and shall submit the report to the controller of examinations. Each student is allotted 4 credits on submission of the report.

Course: Every course offered will have three components associated with the teaching learning process of the paper, namely (i) Lecture - L (ii) Tutorial - T (iii) Practicals - P, (iv) Self study - S where

L stands Lecture session. **T** stands Tutorial session consisting participatory discussion / self study / desk work / brief seminar presentations by students and such other novel methods that make a student to absorb and assimilate more effectively the contents delivered in the Lecture classes.

P stands Practice session and it consists of Hands on experience / Laboratory Experiments / Field Studies / Case studies that equip students to acquire the much required skill component.

S stands Self study session consisting participatory discussion by student with the guidance of faculty. This session is not included in the weekly hour plan.

In terms of credits, every one hour session of L amounts to 1 credit per semester, a minimum of two hour session of T or P amounts to 1 credit per semester and no credits alloted to self study hour, over a period of one semester of 15 weeks for teaching-learning process. The total duration of a semester is 20 weeks inclusive of semester-end examination.

A paper shall have either or all the three components. That means a paper may have only lecture component, or only practical component or combination of any two or all the three components. The total credits earned by a student at the end of the semester upon successfully completing the paper are L + T + P + S. The credit pattern of the paper is indicated as L: T: P: S.

For example: a theory paper with a L-T-P-S schedule of 4-0-0-2 will be assigned 4 credits, and a lab practical paper with a L-T-P-S schedule of 0-0-3-0 will be assigned 3 credits.

The concerned Board of Studies will choose the convenient credit pattern for every paper based on the requirement. However, generally, a paper shall be of 2 - 6 credits.

Different courses of study are labeled and defined as follows:

Core Course

A course which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

A Core course may be a **Soft Core** if there is a choice or an option for the candidate to choose a course from a pool of courses from the main discipline / subject of study or from a sister/related discipline / subject which supports the main discipline / subject. In contrast to the phrase Soft Core, a compulsory core course is called a **Hard Core** Course**.**

Elective Course

Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline / subject of study or which provides an extended scope or which enables an exposure to some other discipline / subject / domain or nurtures the candidate's proficiency/ skill is called an Elective Course. Elective courses may be offered by the main discipline / subject of study or by sister / related discipline / subject of study. A Soft Core course may also be considered as an elective. An elective course chosen generally from an unrelated discipline / subject, with an intention to seek exposure is called an **open elective**. An elective course designed to acquire a special / advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher is called a **Self Study Elective**.

A core course offered in a discipline / subject may be treated as an elective by other discipline / subject and vice versa.

Project work / Dissertation work is a special course involving application of knowledge in solving / analyzing / exploring a real life situation / difficult problem. A project work up to 4 - 6 credits is called Minor Project work. A project work of 8 - 12 credits is called Major Project Work. Dissertation work can be of 8 - 12 credits. A Project / Dissertation work may be a hard core or a soft core as decided by the Board of Studies concerned.

Student Advisor

All teachers of the department shall function as student advisors. There will be more or less an equal number of students assigned to each student advisor of a department. The student advisor will help the students in choosing core and elective courses of study. The student advisor shall be responsible for registration of courses (subjects) by his students. The student advisor will offer all possible student support services.

8. CREDITS

The term credit is used to describe the quantum of syllabus for various programmes in terms of periods of study. It indicates differential weightage given according to the contents duration of the courses in the curriculum design. The minimum credit requirement for a two year Master's programme shall be **90** credits. Each subject (course) is designed variously under lectures / tutorials / laboratory work / seminar / project work etc., to meet effective teaching and learning needs and credits are assigned suitably.

One credit for each lecture / tutorial / project work period per week shall be alloted. In practical, each credit should cover minimum of six experiments. One credit is alloted for two practical hours. Thus normally, in each of the subject, credits will be assigned on the basis of the lectures / tutorials / laboratory work / project work and other forms of learning in a 15

week schedule.

9. SCHEME OF EXAMINATION

There shall be continuous, comprehensive evaluation of students through internal and external examination. At least 2 internal examinations (Sessional Tests) per semester and 1 semester ending examination should be conducted.

Sessional Test I will he held during sixth week for syllabi covered till then. Sessional Test I will be a combination of a variety of tools such as class test, assignment, papr presentation etc., that would

be suitable for the paper. This required an element of openness. The students are to be informed in advance about the nature of assessment and the procedures. However the tests are compulsory. Test I may be for one hour duration. The pattern of question paper will be decided by the respective board of studies.

Sessional Test I will carry 20% of marks of the entire paper.

Sessional Test II will he held during eleventh week for syllabi covered between seventh and eleventh weeks. Sessional Test I will be a combination of a variety of tools such as class test, assignment, paper presentation etc., that would be suitable for the paper. It will also have an element of openness. The students are to be informed in advance about the nature of assessment and the procedures. However the tests are compulsory. Test II may be for one hour duration. The pattern of question paper will be decided by the respective board of studies.

Sessional Test II will carry 20% of marks of the entire paper.

There will be one End Semester examination of 2 - 3 hours duration in each paper. The End semester examination will cover all the syllabi of the paper for 60% of Marks.

A dissertation may be offered in lieu of one / two papers / practicals. It shall be evaluated by two examiners one external and one internal appointed by the Controller of Examination. Wherever there is viva-voce, it shall be conducted by the common Viva Board consisting of the Chairman and internal members of the Board of Examination in the concerned subject, internal guide and one external expert as approved by the Controller of Examinations. End semester practical examinations shall be held before the theory examinations to benefit the students to undertake examinations of other departments.

10. COURSE OF STUDY AND SCHEME OF EXAMINATIONS :

First Semester

Course components	Name of Course	Credits	Exam. Duration	Max. Marks	
				IA	UE
Core -1	Design and Analysis of Algorithms	4	3	25	75
Core -2	Advanced Java Programming	4	3	25	75
Core -3	Systems Software	4	3	25	75
Core – 4	Practical – I: Algorithms Lab	2	3	40	60
Core – 5	Practical – II: Advanced Java Lab.	2	3	40	60
Extra Disciplinary Elective -1	Theoretical Foundations of Computer Science	4	3	25	75
SoftSkill-1		2	3		

Second Semester

Course components	Name of Course	Credits	Exam. Duration	Max. Marks	
				CIA	UE
Core-6	Computer Networks	4	3	25	75
Core-7	Digital Image Processing	4	3	25	75
Core–8	Practical – III: RDBMS Lab.	2	3	40	60
Elective I	Elective – I	3	3	25	75
Core-9	Practical – IV: Image Processing using Java Lab	2	3	40	60
Extra Disciplinary Elective -2	Object Oriented Analysis and Design	3	3	25	75
SoftSkill-2		2	3	40	60
SoftSkill-3		2	3	40	60
Internship	4 to 6 weeks of Internship during summer vacation of I Year				

Third Semester

Course components	Name of Course	*Credits*	*Exam. Duration*	Max. Marks	
				CIA	UE
Core-10	Principles of Compiler Design	4	3	25	75
Core-11	Information Security	4	3	25	75
Core - 12	Artificial Intelligence	4	3	25	75
Elective	Elective –II	4	3	25	75
Elective	Elective – III	4	3	25	75
Core-13	Practical – V: Mini Project	2	3	40	60
Soft Skill-4		2	3	40	60
Internship	During summer vacation 4 to 6 weeks of I Year	2			100

Fourth Semester

Course components	Name of Course	*Credits*	*Exam. Duration*	Max. Marks	
				CIA	UE
Core-14	Project & Viva-Voce	20	-	20	60+ 20

Elective - I
    Mobile Computing OR Software Project Management OR Computer Graphics

Elective - II
    Big data Analytics OR Cryptography OR Distributed Database Systems

Elective - III
    Multimedia Systems OR E-Commerce OR Cloud Computing

Total of 30 hrs was maintained constantly for all semesters. Internship is compulsory and added in the third semester instead of soft skill. Self study elective is optional. Self study elective carries one credit.

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Question Paper Pattern for External Examination

SECTION – A (50 words)

10 out of 12 Questions   - 10 X 1 marks   =   10 marks

SECTION – B (250 words)

5 out of 7 Questions   - 5X 5 marks   = 25 marks

SECTION – C (500 words)

    4out of 6 Questions   - 4 x 10 marks   = 40 marks

                               TOTAL   =   75 Marks

The offer of an Add-on Courses to the students in various disciplines is to enhance their employability. The number of working hours per week for the students for getting the 90 prescribed credits should not exceed 30 hours of class per week and no faculty member should be allocated extra hours beyond the prescribed 16 lecture hours.

Marks for continuous internal assessment (CIA) shall be awarded on the basis of tests, seminars, field work, assignment etc as determined by the Board of Studies in the respective subject. The internal assessment marks shall be notified on the department notice board forinformation of the students and it shall be communicated to the Controller of Examinations 5 days before the commencement of the End Semester examinations, and the Controller of Examinations shall have access to the records of such internal assessment evaluations.

The following procedure be followed for Internal Marks

Theory

Papers: Internal Marks   25

Theory based Continuous Internal Assessment (CIA) - 25

Tests (2 out of 3)   = 10

Attendance*   = 5

Seminars   = 5

Assignments   = 5

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                                            25 marks

A model practical examination is conducted for awarding CIA marks for practical. Question paper pattern for CIA examination is similar to the pattern of end semester examination as decided by Board of Studies.

Dissertation : Internal Marks   :   40

                 External Marks   :   60

                 Total   Marks   :   100

Each department has complete autonomy for designing and scheduling internal examinations / assignments. However transparency and objectivity shall be the main criteria. Records are to be maintained.

11. INSTANT EXAMINATION

Candidates who have passed all the theory papers upto 3rd semester and failed in only one paper pertaining to the 4th semester can apply for Instant Examination. Application form with a demand

draft for Rs.400/-, drawn in favour of "The Principal, Sri Sankara Arts and Science College, Enathur" should be submitted on or before 10 days after the publication of results. The results are published within 15 days after the date of examinations.

12. REQUIREMENTS FOR PROCEEDING TO SUBSEQUENT SEMESTER

i. Candidates shall register their names for the First Semester Examination after the admission in PG Courses.

ii. Candidates shall be permitted to proceed from the First Semester up to Final Semester irrespective of their failure in any of the Semester Examination subject to the condition that the candidates should register for all the arrear subject of earlier semesters along the current (subsequent) Semester Subjects.

iii. Candidates shall be eligible to go to subsequent semester, only if they earn sufficient attendance as prescribed therefore by the Academic Council from time to time. Provided in case of a candidate earning less than 50% of attendance in any one of the Semesters due to any extraordinary circumstances such as medical grounds, such candidates who shall produce Medical Certificate issued by the Authorised Medical Attendant (AMA), duly certified by the Principal of the college, shall be permitted to proceed to the next semester and to complete the Course of study. Such Candidates shall have to repeat the missed Semester by rejoining after completion of Final Semester of the course, after paying the fee for the break of study as prescribed by the Academic Council from time to time.

iv. There shall be examinations at the end of each semester, for odd semesters in the month of October / November, for even semesters in April / May. A candidate who does not pass the examination in any paper(s) shall be permitted to appear in such failed papers in the subsequent examinations to be held in October / November or April / May.

v. The results of all the examinations will be published through the college Website.

13. PASSING MINIMUM

A candidate shall be declared to have passed:

a) There shall be no Passing Minimum for Internal.

b) For External Examination, Passing Minimum shall be of 50 % (Fifty Percentage) of the maximum marks prescribed for the paper for each Paper/Practical/Project and Viva-voce.

c) In the aggregate (External + Internal) the passing minimum shall be of 50%.

d) He/She shall be declared to have passed the whole examination, if he/she passes in all the papers and practicals wherever prescribed / as per the scheme of examinations by earning 90 CREDITS in Parts-I, II, III, IV & V. He / She shall also complete one certificate course to qualify for the Degree.

A candidate who fails in any of the unit / project work / Project Report / dissertation / vivavoice shall reappear in that unit / project work / Project Report / Dissertation / viva-voice and pass the examination subsequently.

14. CLASSIFICATION OF SUCCESSFUL CANDIDATES

PART- I CORE SUBJECTS (COURSE): Successful candidates passing the Examinations for the Language and securing the marks 60 percent and above in the aggregate shall be declared to have passed the examination in the FIRST Class. All other successful candidates shall be declared to have passed the examination in the SECOND Class.

PART – II ELECTIVE SUBJECTS (COURSE): Successful candidates passing the examinations for English and securing the marks 60 percent and above in the aggregate shall be declared to have passed the examination in the FIRST Class. All other successful candidates shall be declared to have passed the examination in the SECOND class.

PART – III Soft skill

Successful Candidate earning of 2 credits for soft skill paper SHALL NOT BE taken into consideration for Classification / Ranking / Distinction.

PART – IV INTERNSHIP

Successful Candidate earning of 2 credits for internship SHALL NOT BE taken into consideration for Classification / Ranking / Distinction.

15. RANKING

Candidates who pass all the examinations prescribed for the Course in the FIRST APPEARANCE ITSELF ALONE are eligible for Ranking / Distinction. Provided in the case of Candidates who pass all the examinations prescribed for the Course with a break in the First Appearance due to the reasons as furnished in the Regulations 11(iii) category are only eligible for Classification.

16. APPEARANCE FOR IMPROVEMENT

Candidates who have passed in a theory paper / papers are allowed to appear again for theory paper / papers only once in order to improve his/her marks, by paying the fee prescribed from time to time. Such candidates are allowed to improve within a maximum period of 10 semesters counting from his/her first semester of his/her admission. If candidate improve his marks, then his improved marks will be taken into consideration for the award of Classification only. Such improved marks will not be counted for the award of Prizes / Medals, Rank and Distinction. If the candidate does not show improvement in the marks, his previous marks will be taken into consideration. No candidate will be allowed toimprove marks in the Practical, Project, Viva-voce, and Field work.

17. CONDONATION

Students must have 75% of attendance in each course for appearing the examination. Students who have 74% to 70% of attendance shall apply for condonation in the prescribed formwith the prescribed fee Rs.200/-.Students who have 69% to 60% of attendance shall apply for condonation in prescribed form with the prescribed fee along with the Medical Certificate. Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after completion of the programme.

18. RETOTALING

Candidates are permitted to apply for retotaling within 10 days from the date of publication of results. The student should submit request for retotaling in the prescribed format.and pay the fee prescribed per paper.

19. PHOTOCOPY OF ANSWER SCRIPT

Candidates are permitted to apply for obtaining a photocopy of answer paper within 20 days from the date of publication of results. The student should submit request for photocopy of answer script in the prescribed format.

20. REVALUATION

Candidates are permitted to apply for revaluation after obtaining a photocopy of answer paper within 30 days from the date of publication of results. The student should submit request for revaluation in the prescribed format and pay the fee prescribed per paper.

21. MALPRACTICE

Any malpractice by the students debars them from subsequent appearance based on the decision of the examination committee. In all cases of malpractice their conduct certificates will indicate malpractice.

22. EVALUATION AND GRADING SYSTEM

The performance of a student in each paper is evaluated in terms of percentage of marks with a provision for conversion to grade points (GP). Evaluation for each paper shall be done by a continuous internal assessment by the concerned paper teacher as well as by an end semester examination and will be consolidated at the end of the course.

The term grading system indicates a Ten Point Scale of evaluation of the performances of students in terms of marks obtained in the Internal and External Examination, grade points and letter grade.

Once the marks of the Internal and end-semester examinations for each of the papers are available, they will be added. The marks thus obtained will then be graded as per details provided in Table.

The sum of total performance in each semester will be rated by Grade Point Average (GPA) while the continuous performance from the second semester onwards will be marked by Cumulative Grade Point Average (CGPA). These two are calculated by the following formulae.

$$GPA = \frac{\text{Sum of [Credits acquired x Grade points]}}{\text{Sum of Credits acquired}}$$

For the calculation of Grade Point Average (GPA), Gi is the grade point awarded; Ci is the credit units earned for the ith paper.

$$CGPA = \frac{\sum_{i=1}^{n} C_i GP_i}{\sum_{i=1}^{n} C_i}$$

where 'Ci' is the Credit earned for the paper i in any semester ; 'Gi' is the Grade Point obtained by the student for the paper i and 'n' is the number of papers passed in that or CGPA = GPA of all the papers starting from the first semester to the current semester.

Note: The GPA and CGPA shall be calculated separately for the following five parts:

Part I: Core Subject; Part II: Elective Subject, Part III: Skill based subjects, Part IV: Internship and Part V: Certificate course

Marks	Grade Point	CGPA	Letter Point	Classification of Final Result
96 and above	10	9.51 and above	S⁺	First Class with Exemplary
91 – 95	9.5	9.01 – 9.50	S	
86 – 90	9.0	8.51 – 9.00	D⁺⁺	First Class with Distinction
81 – 85	8.5	8.01 – 8.50	D⁺	
76 – 80	8.0	7.51 – 8.00	D	
71 – 75	7.5	7.01 – 7.50	A⁺⁺	First Class
66 – 70	7.0	6.51 – 7.00	A⁺	
61 – 65	6.5	6.01 – 6.50	A	
56 – 60	6.0	5.51 – 6.00	B⁺	Second Class
51 – 55	5.5	5.01 – 5.50	B	
46 – 50	5.0	4.51 – 5.00	C⁺	Third Class
40 – 45	4.5	4.00 – 4.50	C	
Below 40	0	Below 4.00	F	Fail

The grade card / mark sheet issued at the end of the semester to each student will contain the following:

a. the marks obtained for each paper registered in the semester

b. the credits earned for each paper registered for that semester

c. the performance in each paper by the letter grade point obtained

d. the Grade Point Average (GPA) of all the papers registered for that semester and

e. from the second semester onwards, the Cumulative Grade Point Average (CGPA) of all the papers and

f. the class and grade of the student in the final CGPA

23. TRANSITORY PROVISION

Candidates who have undergone the course of study prior to the academic year 2015-2016 will be permitted to appear for the examinations under those Regulations for a period of TWO years i.e. upto and inclusive of April - May 2017 Examinations. Thereafter, they will be permitted to appear for the examination only under the Regulations then in force.

M.Sc. DEGREE COURSE IN COMPUTER SCIENCE
Revised Syllabus
Choice Based Credit System

Title of the Course/	Paper		
Title of the Course/ Paper	Design and Analysis of Algorithms		
Core - 1	I Year & First Semester	Credit: 4	

Unit 1: Introduction - Definition of Algorithm – pseudo code conventions – recursive algorithms – time and space complexity –big-"oh" notation – practical complexities – randomized algorithms – repeated element – primality testing **-** Divide and Conquer: General Method - Finding maximum and minimum – merge sort.

Unit-2: Divide and conquer contd. – Quicksort, Selection, Strassen's matrix multiplication – Greedy Method: General Method –knapsack problem - Tree vertex splitting - Job sequencing with dead lines – optimal storage on tapes.

Unit 3: Dynamic Programming: General Method - multistage graphs – all pairs shortest paths – single source shortest paths - String Editing – 0/1 knapsack. Search techniques for graphs – DFS-BFS-connected components – biconnected components.

Unit 4: Back Tracking: General Method – 8-queens - Sum of subsets - Graph Coloring – Hamiltonian cycles. Branch and Bound: General Method - Traveling Salesperson problem.

Unit 5: Lower Bound Theory: Comparison trees - Oracles and advisory arguments - Lower bounds through reduction - Basic Concepts of NP-Hard and NP-Complete problems.

Recommended Texts:
1. E. Horowitz, S. Sahni and S. Rajasekaran, 2007, Computer Algorithms, 2nd Edition, Universities Press, India.
2. A.V. Aho, J.E. Hopcroft, J.D. Ullmann, 1974, The design and analysis of Computer Algorithms, Addison Wesley, Boston.
3. S.E.Goodman and S.T.Hedetniemi, 1977, Introduction to the Design and Analysis of algorithms, Tata McGraw Hill Int. Edn, New Delhi.

Reference Books
   1) G. Brassard and P. Bratley, 1997, Fundamentals of Algorithms, PHI, New Delhi.

E-learning resources
   1) http://www.cise.ufl.edu/~raj/BOOK.html

Title of the Course/ Paper	Advanced Java Programming		
Core – 2	I Year & First Semester	Credit: 4	

Unit 1: Servlet Overview – Servlet life cycle - The Java Web Server – Simple Servlet – Servlet Packages – Using Cookies - - Session Tracking - Security Issues – using JDBC in Servlets – HTML to Servlet Communication - applet to servlet communication.

Unit 2: Java Beans: The software component assembly model- The java bean development kit-developing beans – notable beans – using infobus - Glasgow developments - Application Builder tool-JAR files-Introspection-Bound Properties-Persistence-customizers - java beans API.

Unit 3: EJB: EJB architecture- EJB requirements – design and implementation – EJB session beans- EJB entity beans-EJB Clients – deployment tips, tricks and traps for building distributed and other systems – implementation and future directions of EJB-Variable in perl- perl control structures and operators – functions and scope

Unit 4: RMI – Overview – Developing applications with RMI: Declaring & Implementing remote interfaces-stubs & skeletons, Registering remote objects, writing RMI clients –Pushing data from RMI Servlet – RMI over Inter-ORB Protocol

Unit 5: JSP –Introduction JSP-Examining MVC and JSP -JSP scripting elements & directives-Working with variables scopes-Error Pages - using Java Beans in JSP Working with Java Mail-Understanding Protocols in Java mail-Components-Java mail API-Integrating into J2EE-Understanding Java Messaging Services-Introducing Java Transactions.

Recommended Text:

1) James McGovern, Rahim , Adatia, Yakor Fain, 2003, J2EE 1.4 Bible, Wiley-dreamtech India Pvt. Ltd, New Delhi
2) Herbert Schildt, 2002, Java 2 Complete Reference, 5th Edition, Tata McGraw Hill, New Delhi.
3) Jamie Jaworski, 1999, Java 2 Platform – Unleashed, First Edition, Techmedia-SAMS.

Reference books:

(1) K. Moss, 1999, Java Servlets, Second edition, Tata McGraw Hill, New Delhi.
(2) D. R.Callaway,1999, Inside Servlets, Addison Wesley, Boston
(3) Joseph O'Neil, 1998, Java Beans from the Ground Up, Tata McGraw Hill, New Delhi.
(4) T. Valesky, T.C. Valesky, 1999, Enterprise JavaBeans, Addison Wesley.
(5) Cay S Horstmann & Gary Cornell, 2013, Core Java Vol II Advanced Features, 9th Edition, Addison Wesley.

Title of the Course/ Paper	System Software		
Core - 3	I Year & First Semester	Credit: 4	

Unit 1: Language processors – Language processing activities and fundamentals – Language specification – Development Tools – Data Structures for Language processing- Scanners and Parsers.

Unit 2: Assemblers: Elements of Assembly language programming - Overview of the Assembly process - Design of a Two-pass Assembler - A single pass Assembler for the IBM PC.

Unit 3: Macros and Macro processors – Macro definition, call and expansion – Nested macro calls – Advanced macro facilities - Design of a macro preprocessor - Compilers: Aspects of compilation.

Unit 4: Compilers and Interpreters – Memory allocation - Compilation of Expressions and Control structures - Code optimization – Interpreters.

Unit 5 : Linkers: Linking and Relocation concepts – Design of a linker – Self relocating Programs – A linker for MS DOS - Linking for over-lays – loaders - Software tools: Software tools for program development - Editors - Debug monitors - Programming environments – User interfaces.

Recommended Texts

1. D. M. Dhamdhere, 1999, Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw-Hill, New Delhi.
2. L. L. Beck, 1996, System Software An Introduction to System Programming, 3rd edition, Addison-Wesley.

Reference:

1. M. Joseph. System Software. Firewall Media
2. System Software: An Introduction to systems programming by Leland Beck (Pearson)
3. System Software : Nityashri,(McGraw-Hill Education)

Title of the Course/ Paper	Practical – I: Algorithms Lab		
Core – 4	I Year & First Semester	Credit: 2	

1. Divide and Conquer :

    a. Merge Sort

    b. Quick Sort

    c. Maximum and Minimum

2. Greedy Method :

    a. Knapsack Problem

    b. Tree vertex splitting

    c. Job Sequencing

3. Dynamic Programming :

    a. Multistage graphs

    b. All Pairs Shortest Paths

    c. String Editing,

    d. BFS and DFS.

4. Back Tracking :

    a. 8 Queen Problems

    b. Hamiltonian Cycles.

Title of the Course/ Paper	Practical – II: Advanced Java Programming Lab		
Core – 5	I Year & First Semester	Credit: 2	

1. HTML to Servlet Applications

2. Applet to Servlet Communication

3. Designing online applications with JSP

4. Creating JSP program using JavaBeans

5. Working with Enterprise JavaBeans

6. Performing Java Database Connectivity.

7. Creating Web services with RMI.

8. Creating and Sending Email with Java

9. Building web applications

Title of the Course/ Paper	Theoretical Foundations of Computer Science		
Extra Disciplinary Elective -1	First Year & First Semester		

Unit 1: Propositions and Compound Propositions – Logical Operations – Truth Tables – Tautologies and Contradictions – Logical Equivalence –Algebra of Propositions – Conditional and Biconditional Statements –Arguments – Logical Implication – Quantifiers – Negation of Quantified Statements – Basic Counting Principles – Factorial – Binomial Coefficients – Permutations – Combinations – Pigeonhole Principle – Ordered and Unordered Partitions.

Unit 2: Order and Inequalities – Mathematical Induction – Division Algorithm – Divisibility – Euclidean Algorithm – Fundamental Theorem of Arithmetic – Congruence Relation – Congruence Equations – Semigroups – Groups – Subgroups – Normal Subgroups – Homomorphisms – Graph Theory: basic definitions-paths, reachability, connectedness matrix representation of graphs, trees.

Unit 3: Finite Automata and Regular Expressions: Finite State Systems – Basic definitions – Non-deterministic finite automata – Finite automata with -moves – Regular expressions.

Unit 4: Properties of Regular sets: Pumping lemma – Closure properties – Decision Algorithms – My hill
– Nerode Theorem – Context Free Grammars – Derivation Trees.

Unit 5: Simplifying Context free grammars - Chomsky normal forms – Greibach Normal forms – Pushdown automata and context-free languages.

1. Recommended Texts
   (i)   J.P. Tremblay and R. Manohar, 1997, Discrete Mathematical Structures with applications to Computer Science, Tata McGraw-Hill, New Delhi.
   (ii)   P. Linz, 1997, An Introduction to Formal Languages and Automata, Second Edition, Narosa Pub. House, New Delhi.
   (iii)   S. Lipschutz and M. Lipson, 1999, Discrete Mathematics, Second Edition, Tata McGraw-Hill, New Delhi.
   (iv)   J.E.Hopcraft and J.D.Ullman, 1993, Introduction to Automata Theory, Languages and Computation, Narosa Publishing House, New Delhi.

2. Reference Books
   (i)   D.C.Kozen, 1997, Automata and Computability, Springer-Verlag, New York.
   (ii)   J. Martin, 2003, Introduction to Languages and the Theory of Computation, 3rd Edition, Tata McGraw-Hill, New Delhi.

Title of the Course/ Paper	Computer Networks		
Core - 6	I Year & Second Semester	Credit: 4	

Unit 1: Introduction – Network Hardware – Software – Reference Models – OSI and TCP/IP models – Example networks: Internet, 3G Mobile phone networks, Wireless LANs –RFID and sensor networks - Physical layer – Theoretical basis for data communication - guided transmission media

Unit-2: Wireless transmission - Communication Satellites – Digital modulation and multiplexing - Telephones network structure – local loop, trunks and multiplexing, switching. Data link layer: Design issues – error detection and correction.

Unit 3: Elementary data link protocols - sliding window protocols – Example Data Link protocols – Packet over SONET, ADSL - Medium Access Layer – Channel Allocation Problem – Multiple Access Protocols.

Unit 4: Network layer - design issues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol – IP Address – Internet Control Protocol.

Unit 5: Transport layer – transport service- Elements of transport protocol - Addressing, Establishing & Releasing a connection – Error control, flow control, multiplexing and crash recovery - Internet Transport Protocol – TCP - Network Security: Cryptography.

Recommended Texts:

A. S. Tanenbaum, 2011, Computer Networks, Fifth Edition, Pearson Education, Inc.

B. Forouzan, 1998, Introduction to Data Communications in Networking, Tata McGraw Hill, New Delhi.

F. Halsall, 1995, Data Communications, Computer Networks and Open Systems, Addison Wessley.

Reference Books

1) D. Bertsekas and R. Gallagher, 1992, Data Networks, Prentice hall of India, New Delhi.

2) Lamarca, 2002, Communication Networks, Tata McGraw Hill, New Delhi.

Website, E-learning resources

1) http://peasonhighered.com/tanenbaum

Title of the Course/ Paper	Digital Image Processing		
Core - 7	I Year & Second Semester	Credit: 4	

Unit 1: Introduction – steps in image processing - Image acquisition - representation - sampling and quantization - relationship between pixels. – color models – basics of color image processing.

Unit-2: Image enhancement in spatial domain – some basic gray level transformations – histogram processing – enhancement using arithmetic, logic operations – basics of spatial filtering and smoothing.

Unit 3: Image enhancement in Frequency domain – Introduction to Fourier transform: 1- D, 2 –D DFT and its inverse transform - smoothing and sharpening filters.

Unit 4: Image restoration: Model of degradation and restoration process – noise models – restoration in the presence of noise- periodic noise reduction. - Image segmentation: Thresholding and region based segmentation.

Unit 5: Image compression: Fundamentals – models – information theory – error free compression –Lossy compression: predictive and transform coding - JPEG standard.

Recommended Texts:

C. Gonzalez, R.E.Woods, 2009, Digital Image processing, 3rd Edition, Pearson Education.

Pratt.W.K.,Digital Image Processing, 3rd Edition, John Wiley & Sons.

Rosenfled A. & Kak, A.C, 1982, Digital Picture Processing, vol .I & II, Academic Press

  Website and e-Learning Source:
1) http://www.imageprocesssingplace.com/DIP/dip-downloads.

Title of the Course/ Paper	Practical – III: RDBMS Lab		
Core - 8	I Year & Second Semester	Credit: 2	

1. Library Information Processing.
2. Students Mark sheet processing.
3. Telephone directory maintenance.
4. Gas booking and delivery system.
5. Electricity Bill Processing.
6. Bank Transactions (SB).
7. Pay roll processing.
8. Inventory
9. Question Database and conducting quiz.
10. Purchase order processing.

Title of the Course/ Paper	Practical – IV: Image Processing using Java Lab		
Core – 9	I Year & Second Semester	Credit: 2	

1) Basic image manipulation (reading, writing, quantization, sub sampling)
2) Basic Intensity transformation
3) Histogram Processing
4) Filtering in spatial domain-2D FFT and smoothing filters
5) Image coding using transformations with SPIHT algorithm
6) Color image Enhancement with spatial sharpening.

Title of the Course/ Paper	Object Oriented Analysis and Design		
Extra Disciplinary Elective - 2	I Year & Second Semester	Credit: 3	

Unit 1: System Development - Object Basics - Development Life Cycle - Methodologies - Patterns -

Frameworks - Unified Approach - UML.

Unit-2: Use-Case Models - Object Analysis - Object relations - Attributes - Methods – Class and Object responsibilities - Case Studies.

Unit 3: Design Processes - Design Axioms - Class Design - Object Storage - Object Interoperability -

Case Studies.

Unit-4: User Interface Design - View layer Classes - Micro-Level Processes - View Layer Interface -

Case Studies.

Unit-5: Quality Assurance Tests - Testing Strategies - Object orientation on testing - Test Cases - test Plans - Continuous testing - Debugging Principles - System Usability - Measuring User Satisfaction - Case Studies.

Recommended Texts

(i)   Ali Bahrami, Reprint 2009, Object Oriented Systems Development, Tata McGraw Hill International Edition.

Reference Books

(i)   G. Booch, 1999, Object Oriented Analysis and design, 2nd Edition, Addison Wesley, Boston

(ii)   Roger S.Pressman, 2010, Software Engineering A Practitioner's approach, Seventh

         Edition, Tata McGraw Hill, New Delhi.

(iii)   Rumbaugh, Blaha, Premerlani , Eddy, Lorensen, 2003, Object Oriented Modeling And design , Pearson education, Delhi.

Title of the Course/ Paper	Principles of Compiler Design		
Core - 10	II Year & Third Semester	Credit: 4	

Unit 1: Introduction to Compilers - Finite Automata and lexical Analysis.

Unit-2: Syntax Analysis: Context free grammars - Derivations and parse trees – Basic parsing techniques

- LR parsing.

Unit 3: Syntax - directed translation, symbol tables.

Unit 4: Code optimization - More about code optimization.

Unit 5: Code generation - Error detection and recovery.

Recommended Texts:

1) A.V. Aho, J.D.Ullman, 1985, Principles of Compiler Design, Narosa Pub-House.

Reference Books

1) D.Gries, 1979, Compiler Construction for Digital Computers, John Wiley & Sons.

2) A.V.Aho, Ravi Sethi, and J.D.Ullman, 1986, Compilers Principles, Techniques and Tools, Addison Wesley Pub. Co.

Title of the Course/ Paper	Information Security		
Core - 11	II Year & Third Semester	Credit: 4	

Unit 1: Introduction: Security- Attacks- Computer criminals- Method of defense Program Security: Secure programs- Non-malicious program errors- Viruses and other malicious code- Targeted malicious code- Controls against program threats

Unit 2: Operating System Security: Protected objects and methods of protection- Memory address protection- Control of access to general objects- File protection mechanism- Authentication: Authentication basics- Password- Challenge-response- Biometrics.

Unit 3: Database Security: Security requirements- Reliability and integrity- Sensitive data- Interface-Multilevel database- Proposals for multilevel security

Unit 4: Security in Networks: Threats in networks- Network security control- Firewalls- Intrusion detection systems- Secure e-mail- Networks and cryptography- Example protocols: PEM- SSL- Ipsec.

Unit 5: Administrating Security: Security planning- Risk analysis- Organizational security policies-Physical security - Legal- Privacy- and Ethical Issues in Computer Security - Protecting programs and data- Information and law- Rights of employees and employers- Software failures- Computer crime-Privacy- Ethical issues in computer society- Case studies of ethics.

Recommended Text

1) C. P. Pfleeger, and S. L. Pfleeger, Security in Computing, Pearson Education, 4th Ed, 2003
2) Matt Bishop, Computer Security: Art and Science, Pearson Education, 2003.
3) Eric Maiwald, Network Security : A Beginner's Guide, TMH, 1999

Reference Books

1) Stallings**,** Cryptography & N/w Security: Principles and practice, 4th Edition,2006
2) Kaufman, Perlman, Speciner, Network Security, Prentice Hall, 2nd Edition, 2003

3) Macro Pistoia, Java Network Security, Pearson Education, 2nd Edition, 1999
4) Whitman, Mattord, Principles of information security*,* Thomson, 2nd Edition, 2005

Website and e-Learning Source

1) http://www.cs.gsu.edu/~cscyqz/courses/ai/aiLectures.html
2) http://www.eecs.qmul.ac.uk/~mmh/AINotes/

Title of the Course/ Paper	Artificial Intelligence		
Core 12	II Year & Third Semester	Credit: 4	

Unit 1: Introduction - Intelligent Agents- Problem Solving - by Searching - Informed Search and Exploration - Constraint Satisfaction Problems - Adversarial Search

Unit-2: Knowledge and Reasoning - Logical Agents - First-Order Logic - Inference in First-Order Logic - Knowledge Representation

Unit 3: Planning – Planning and Acting in the Real World - Uncertain knowledge and reasoning - Uncertainty - Probabilistic Reasoning - Probabilistic Reasoning Over Time - Making Simple Decisions - Making Complex Decisions

Unit 4: Learning - Learning from Observations - Knowledge in Learning - Statistical Learning Methods - Reinforcement Learning

Unit 5: Communicating, Perceiving, and Acting - Communication - Probabilistic Language Processing - Perception – Robotics.

Recommended Texts:

1) Stuart Russell and Peter Norvig, 2003, Artificial Intelligence: A Modern Approach, 2nd Edition, Prentice Hall of India, New Delhi.

Reference Books

1) Elaine Rich and Kevin Knight, 1991, Artificial Intelligence, 2nd Edition, Tata McGraw-Hill, New Delhi.

2) Herbert A. Simon, 1998, The Sciences of the Artificial Intelligence, 3rd Edition, MIT Press.

3) N.J. Nilson, 1983, Principles of AI, Springer Verlag.

Website and e-Learning Source:

1) http://aima.eecs.berkeley.edu/slides-pdf/

Title of the Course/ Paper	Practical – V:Mini Project		
Core – 13	II Year & Third Semester	Credit: 2	

Each student will develop and implement individually application software based on any emerging latest technologies.

Title of the Course/ Paper	Project & Viva-Voce		
Core-14	II Year & Fourth Semester	Credit: 20	

The project work is to be carried out either in a software industry or in an academic institution for the entire semester and the report of work done is to be submitted to the University.

LIST OF ELECTIVES

Title of the Course/ Paper	Mobile Computing		
Elective - 1	I Year & Second Semester	Credit: 3	

Unit 1: Introduction - Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing –Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems- Medium Access Control – Comparisons.

Unit 2: Telecommunication Systems – GSM – Architecture – Sessions – Protocols – Hand Over and Security – UMTS and IMT – 2000 – Satellite Systems.

Unit 3: Wireless Lan - IEEE S02.11 – Hiper LAN – Bluetooth – Security and Link Management.

Unit 4: Mobile network layer - Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies

Unit 5: Mobile transport layer - Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance.

Recommended Text
1) J. Schiller, 2003, Mobile Communications,2nd edition, Pearson Education, Delhi.
2) Pahlavan, Krishnamurthy, 2003(2002), Principle of wireless Networks: A unified Approach, Pearson Education,Delhi.
3) Hansmann, Merk, Nicklous, Stober, 2004, Principles of Mobile Computing, 2nd Edition, Springer (India).

Reference Books

1. Martyn Mallick, 2004, Mobile and Wireless Design Essentials, Wiley Dreamtech India Pvt. Ltd., NewDelhi.

2. W.Stallings, 2004, Wireless Communications and Networks, 2nd Edition, Pearson Education, Delhi.

Website and e-Learning Source

1) http://csbdu.in/pdf/mobile%20communication.pdf

Title of the Course/ Paper	Software Project Management		
Elective - 1	I Year & Second Semester	Credit: 3	

Unit-I: Introduction to Software Project Management- Software project versus other types of project- problems- management control- Stakeholders- Requirement Specification – Information and control in organizations Introduction to step wise project planning- Select-identify scope and objectives- identify project infrastructure- Analyse project characteristics- products and activities-Estimate effort for each activity- Identify activity risks- Allocate resources- Review/ publicize plan-Execute plan and lower levels of planning. Project evaluation- Introduction – Strategic assessment-technical assessment- cost benefit analysis- cash flow forecasting- cost- benefit evaluation techniques- risk evaluation

Unit-II: Selection of an appropriate project approach- choosing technologies- technical plan contents list- choice of process models- structured methods-rapid application development-waterfall model- v-process model-spiral model- software prototyping- ways of categorizing prototypes- tools- incremental delivery- selecting process model - Software effort estimation-introduction- where-problems with over and under estimates- basis for software estimating-software effort estimation technique- expert judgement- Albercht function point analysis- Function points Mark II- Object points- procedural code oriented approach-   COCOMO. Activity Planning-Objectives- Project schedules- projects and activities- sequencing and scheduling activities-network planning models- formulating a network model- using dummy activities- representing lagged activities- adding time dimension- forward pass- backward pass- identifying the critical

path- Activity float- shortening project duration – identifying critical activities-precedence networks

Unit-III: Risk Management- nature of risk- managing- identification-analysis- reducing-evaluating- z values. Resource allocation- nature of resources- requirements-scheduling- critical paths- counting the cost-resource schedule- cost schedule- scheduling sequence. Monitoring and control- creating the frame work- collecting the data- visualizing the progress- cost monitoring-earned value- prioritizing monitoring-Change control.

Unit-IV: Managing contracts- types of contract- stages in contract placement- terms of a contract-contract management- acceptance. Managing people and organizing teams- organizational behaviour background- selecting the right person for the job- instruction in the best methods-motivation- decision making-leadership-organizational structures. Software quality- importance-defining –ISO9126- practical measures- product versus process quality management- external standards-techniques to help enhance software quality

Unit-V: Small   projects- some problems- content of a project plan. PRINCE 2- an overview-BS6079:1996- an overview - Euro method- an overview

Books for Study:

1. Bob Hughes and Mike Cotterell – Software project management-second edition- McGraw Hill.
2. Walker Royce - Software Project Management - Addison Wesley.
3. Agarwal, Bharat Bhushan, and Sumit Prakash Tayal. *Software Project Management*. Laxmi Publications, 2011.

E-learning resources

  1) http://www.bcnn.net

Title of the Course/ Paper	Computer Graphics		
Elective - 1	I Year & Second Semester	Credit: 3	

Unit 1: Introduction to computer Graphics – Video display devices – Raster Scan Systems – Random Scan Systems - Interactive input devices – Hard Copy devices - Graphics software – Area fill attributes – Character attributes inquiry function - Output primitives – line drawing

algorithms – initializing lines – line function – Circle Generating algorithms – Ellipse Generating algorithms - Attributes of output primitives – line attributes – Color and Grayscale style.

Unit 2: – Two dimensional transformation – Basic transformation – Matrix representation and Homogeneous co-ordinates - Composite transformation – Matrix representation – other transformations– two dimensional viewing – window – to- viewport co-ordinate transformation.

Unit 3: Clipping algorithms – Point clipping -line clipping - polygon clipping – Curve clipping - text clipping – Exterior clipping –– Three dimensional transformations – translation- rotation- scaling – composite-shears and reflections - Three dimensional viewing – Projection – Orthogonal and oblique parallel projections.

Unit 4: – Viewing - perspective projection – Three dimensional clipping algorithms- Visible surface detection methods -– backface detection, depth buffer, A-buffer, scan-line, depth sorting, BSP-tree, area subdivision, octree and other methods.

Unit 5 : Computer Animation - Three dimensional object representations – Spline representation - Bezier curves and surfaces – B-Spline curves and surfaces -– Color models and color applications.

Recommended Text

1. D. Hearn, M.P. Baker, and W.R. Carithers, 2011 – Computer Graphics with openGL, 4th Edition, Pearson Education
2. S. Harrington, 1989, Fundamentals of Computer Graphics, Tata McGraw-Hill, New Delhi.
3. D. F. Rogers, J. A. Adams, 2002, Mathematical elements for Computer Graphics, 2nd Edition, Tata McGraw-Hill, New Delhi.

Reference Books

1) W.M. Neumann and R. F. Sproull, Principles of Interactive Computer Graphics, Tata McGraw-Hill, New Delhi.

2) D. F. Rogers, 2001, Procedural elements for Computer Graphics, 2nd Edition, Tata McGraw-Hill, New Delhi.

3) Foley, Van Dan, Feiner, Hughes, 2000, Computer Graphics, Addison Wesley, Boston

Website and E-Learning Source

1) http://forum.jntuworld.com/showthread.php?3846-Computer-Graphics- Notes-All-8- Units

2) http://www.cs.kent.edu/~farrell/cg05/lectures/index.html

Title of the Course/ Paper	Big Data Analytics		
Elective - 2	II Year & Third Semester	Credit: 4	

Unit 1: Basic nomenclature - Analytics process model - Analytics model requirements - Types of data sources – Sampling - types of data elements - Visual Data Exploration and Exploratory Statistical Analysis - Missing Values - Outlier Detection and Treatment - Standardizing Data – Categorization - weights of evidence coding - Variable selection -Segmentation.

Unit 2: Predictive Analytics: Target Definition - Linear Regression - Logistic Regression - Decision Trees - Neural Networks - Support Vector machines - Ensemble Methods - Multiclass Classification Techniques - Evaluating Predictive Models.

Unit 3: Descriptive Analytics: Association Rules - Sequence Rules - Segmentation. Survival Analysis: Survival Analysis Measurements - Parametric Survival Analysis.

Unit 4: Social Network Analytics: Social Network Definitions - Social Network Metrics - Social Network Learning -Relational Neighbor Classifier - Probabilistic Relational Neighbor Classifier - Relational logistic Regression - Collective Inference.

Unit 5: Benchmarking - Data Quality - Software – Privacy - Model Design and Documentation - Corporate Governance. Example applications: Credit Risk Modeling - Fraud Detection - Recommender Systems - Web Analytics.

Recommended Text:

1) Baesens, 2014, Analytics in a Big Data World: The Essential Guide to Data Science and Its applications, Wiley India Private Limited

Reference Books

1) Michael Minelli, Michele Chambers, 2013, Big Data, Big Analytics: Emerging Business
   Intelligence and Analytic Trends for Today's Businesses, Wiley CIO

2) Stephan Kudyba, 2014, Big Data, Mining and Analytics: Components of Strategic Decision Making, CRC Press.

3) Frank J. Ohlhorst, 2013, Big data Analytics: Turning Big Data into Big Money, Wiley and SAS Business Series.

4) Foster Provost, Tom Fawcett, 2013, Data Science for Business, SPD.

Title of the Course/ Paper	Cryptography		
Elective - 2	II Year & Third Semester	Credit: 4	

Unit 1: Conventional Encryption: Conventional encryption model – DES –RC 5 – Introduction to AES - Random number generation.

Unit-2: Number Theory: Modular arithmetic – Euler's theorem – Euclid's algorithm – Chinese remainder theorem – Primarily and factorization –Discrete logarithms – RSA algorithm

Unit 3: Public key Cryptography: Principles – RSA algorithm – key management- Diff – Hellman key exchange

Unit 4: Message Authorization and Hash functions: Hash functions- Authentication requirements –Authentication function- Message authentication codes –Secure Hash algorithms

Unit 5: Digital Signature and Authentication Protocols : Digital Signature- Authentication Protocols – Digital signature standard.

Recommended Texts:

1) Stallings, W., 2005 , Cryptography and Network Security Principles and Practice, Pearson Education, Delhi.

Reference Books

1) Charlie Kaufman, Radia Perlman, Mike specimen, Network Security- Private Communication in a Public world.

2) Michael Welsehenbach, 2005, Cryptography in C & C++", John Wiley.

3) Bruce sehneier, 2001 Applied Cryptography, John Wiley and sons.

4) Kailash N.Gupta , Kamlesh N. Agarwala, Pratek A. Agarwala, 2005, Digital signature Network security practices , PHI, New Delhi.

Title of the Course/ Paper	Distributed Database Systems		
Elective - 2	II Year & Third Semester	Credit: 4	

Unit 1: Features of Distributed versus Centralized Databases – Why Distributed Databases – Distributed Database Management Systems (DDBMSs)- Review of Databases – Review of Computer Networks-Levels of Distribution Transparency- Reference Architecture for Distributed Databases – Types of Data Fragmentation – Distribution Transparency for read-only Applications – Distribution transparency for Update Applications – Distributed Database Access Primitives – Integrity Constraints in Distributed Databases - A Framework for Distributed Database Design – The Design of Database Fragmentation – The Allocation of Fragments.

Unit-2: Equivalence Transformations for Queries – Transforming Global Queries into Fragment Queries

– Distributed Grouping and Aggregate Function Evaluation – Parametric Queries -Optimization of Access Strategies - A Framework for Query Optimization – Join Queries – General Queries. A Framework for Transaction Management – Supporting Atomicity of Distributed Transactions – Concurrency Control for Distributed Transactions – Architectural Aspects of Distributed Transactions.

Unit 3: Foundations of Distributed Concurrency Control – Distributed Deadlocks – Concurrency Control Based on Timestamps – Optimistic Methods for Distributed Concurrency Control - Reliability – Basic Concepts Nonblocking Commitment Protocols – Reliability and Concurrency Control – Determining a Consistent View of the Network – Detection and Resolution of Inconsistency – Checkpoints and Cold Restart - Distributed Database Administration – Catalog Management in Distributed Databases – Authorization and Protection.

Unit-4: Distributed object database management systems – Fundamental object concepts and Models – Object – Abstract Data Types – Composition (Aggregation) – Class – Collection – Subtyping and Inheritance. – Object Distribution Design – Horizontal Class Partitioning – Vertical Class Partitioning – Path Partitioning – Class Partitioning Algorithms – Allocation – Replication – Alternative Client / Server Architectures – Cache Consistency – Object Identifier Management – Pointer Switching Object Migration – Distributed Object Storage – Object Query Processor Architectures – Query Processing Issues – Query Execution – Correctness Criteria – Transaction Models and Object Structures – Transactions Management in Object DBMSs – Transactions as Objects – Conclusion – Bibliographic Notes – Exercises.

Unit-5 : Parallel Database Systems – Database Server Approach – Database Servers and Distributed Databases – Parallel System Architectures – Objectives – Functional Aspects – Parallel Data Processing – Parallel Query Optimization – Data Placement – Query Parallelism – Parallel Execution Problems – Initialization – Interferences and Convoy Effect – Load Balancing – Parallel Execution for Hierarchical Architecture – Problem Formulation – Basic Concepts – Load Balancing Strategy – Performance Evaluation – Conclusion – Bibliographic Notes – Exercises.

Recommended Text:

1) Stefano Ceri, Giuseppe Pelagatti, Distributed Databases Principles & Systems, McGraw-Hill.
2) M.Tamer Ozsu, Patrick Valduriez, Distributed database systems, 2nd Edition, Prentice Hall of India, New Delhi.

Title of the Course/ Paper	Multimedia Systems		
Elective - 3	II Year & Third Semester	Credit: 4	

Unit 1: Introductory Concepts: Multimedia – Definitions, CD-ROM and the Multimedia Highway, Uses of Multimedia, Introduction to making multimedia – The Stages of project, the requirements to make good multimedia, Multimedia skills and training, Training opportunities in Multimedia. Motivation for multimedia usage, Frequency domain analysis, Application Domain.

Unit 2: Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software

– Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.

Unit 3: Multimedia – making it work – multimedia building blocks – Text, Sound, Images, Animation and Video, Digitization of Audio and Video objects, Data Compression: Different algorithms concern to text, audio, video and images etc., Working Exposure on Tools like Dream Weaver, Flash, Photoshop Etc.,

Unit 4: Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.

Unit 5 : Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology.

Recommended Texts:
1. S. Heath, 1999, Multimedia & Communication Systems, Focal Press, UK.
2. T. Vaughan, 1999, Multimedia: Making it work, 4th Edition, Tata McGraw Hill, New Delhi.
3. K. Andleigh and K. Thakkar, 2000, Multimedia System Design, PHI, New Delhi.

Reference Books
1) Keyes, "Multimedia Handbook", TMH, 2000.

2) R. Steinmetz and K. Naharstedt, 2001, Multimedia: Computing, Communications & Applications, Pearson, Delhi.
3) S. Rimmer, 2000, Advanced Multimedia Programming , PHI, New Delhi..
   Website and e-Learning Source :
1) http://www.cikon.de/Text_EN/Multimed.html

Title of the Course/ Paper	E- Commerce		
Elective - 3	II Year & Third Semester	Credit: 4	

Unit 1: Introduction to Electronic Commerce: Electronic Commerce Framework – Electronic Commerce and Media Convergence – The Anatomy of E-Commerce Applications – Electronic Commerce Consumer Applications – Electronic Commerce Organization Applications. The Network Infrastructure for Electronic Commerce: Components of the I way – Network Access Equipment – Global information Distribution Networks.

Unit 2: The Internet as a Network Infrastructure: The Internet Terminology – NSFNET: Architecture and Components – National Research and Education Network – Globalization of the Academic Internet - Internet Governance – An overview of Internet Applications. The Business of Internet Commercialization: Telco/Cable/On-Line Companies - National Independent ISPs – Regional Level ISPs – Local –level ISPs – Service Provider Connectivity - Internet Connectivity options.

Unit 3: Network Security and Firewalls: Client Server Network Security and Threats. Electronic Commerce and the World Wide Web: Architectural Framework for Electronic commerce – World Wide Web (WWW) as the Architecture – Hypertext Publishing - Technology behind the Web – Security and the Web. Consumer-Oriented Electronic Commerce: Consumer-Oriented Applications – Mercantile process models – Mercantile Models from the Consumers and the Merchant's Perspective.

Unit 4: Electronic Payment Systems: Types of Electronic Payment Systems – Digital Token based Electronic Payment Systems – Smart Cards and Credit Card – Based Electronic Payment Systems – Risk and Electronic Payment Systems – Designing Electronic Payment Systems. Inter-organizational Commerce and EDI: Electronic Data Interchange – Applications in Business –Legal, Security and Privacy issues - Internet –Based EDI.

Unit 5: Advertising and the Marketing on the Internet: The New Age of Information based marketing and Advertising on the Internet – Consumer Search and Resource Discovery Paradigms and Retrieval - Electronic Commerce Catalogs or Directories – Information

filtering – Consumer – Data Interface : Emerging Tools. On Demand Education and Digital Copyrights: Computer based Education and Training – Technological Components of Education on demand. Software Agents: Characteristics and Properties of Agents – The Technology behind Software Agents – Applets, Browsers and Software Agents- Software Agents in Action.

Recommended Texts

1) Ravi Kalakota and Andrew B. Whinston, Eleventh Impression, 2011,, Frontiers of Electronic Commerce, Pearson Education Inc., Delhi.

Reference Books

(1) Daniel Minoli, and Emma Minoli, Seventh Reprint 2003, Web commerce Technology Handbook, Tata McGraw Hill, New Delhi.

Title of the Course/ Paper	Cloud Computing		
Elective - 3	II Year & Third Semester	Credit: 4	

Unit 1: UNDERSTANDING CLOUD COMPUTING: Cloud Computing –History of Cloud Computing – Cloud Architecture –Cloud Storage –Why Cloud Computing Matters –Advantages of Cloud Computing – Disadvantages of Cloud Computing –Companies in the Cloud Today –Cloud Services

Unit 2: DEVELOPING CLOUD SERVICES: Web-Based Application –Pros and Cons of Cloud Service Development –Types of Cloud Service Development –Software as a Service –Platform as a Service-Infrastructure as a service –Web Services –On-Demand Computing –Discovering Cloud Services Development Services and Tools –Amazon Ec2 –Google App Engine –IBM Clouds

Unit 3: CLOUD COMPUTING FOR EVERYONE: Centralizing Email Communications –Collaborating on Schedules –Collaborating on To-Do Lists –Collaborating Contact Lists –Cloud Computing for the Community –Collaborating on Group Projects and Events – Cloud Computing for the Corporation

Unit 4: USING CLOUD SERVICES: Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications –Exploring Online Planning and Task Management – Collaborating on Event Management –Collaborating on Contact

Management –Collaborating on Project Management –Collaborating on Word Processing - Collaborating on Databases –Storing and Sharing Files

Unit 5: OTHER WAYS TO COLLABORATE ONLINE: Collaborating via Web-Based Communication Tools –Evaluating Web Mail Services –Evaluating Web Conference Tools –Collaborating via Social Networks and Groupware –Collaborating via Blogs and Wikis

Recommended Text

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

2. Kumar Saurabh, "Cloud Computing –Insights into New Era Infrastructure", Wiley Indian Edition, 2011

3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008

Syllabus Updated :

Title of the Course/ Paper	Software Project Management		
Elective - 1	I Year & Second Semester	Credit: 3	

Unit-I: Introduction to Software Project Management- Software project versus other types of project- problems- management control- Stakeholders- Requirement Specification – Information and control in organizations Introduction to step wise project planning- Select- identify scope and objectives- identify project infrastructure- Analyse project characteristics- products and activities- Estimate effort for each activity- Identify activity risks- Allocate resources- Review/ publicize plan- Execute plan and lower levels of planning. Project evaluation- Introduction – Strategic assessment- technical assessment- cost benefit analysis- cash flow forecasting- cost- benefit evaluation techniques- risk evaluation

Unit-II: Selection of an appropriate project approach- choosing technologies- technical plan contents list- choice of process models- structured methods-rapid application development- waterfall model- v-process model-spiral model- software prototyping- ways of categorizing prototypes- tools- incremental delivery- selecting process model - Software effort estimation-

introduction- where-problems with over and under estimates- basis for software estimating- software effort estimation technique- expert judgement- Albercht function point analysis- Function points Mark II- Object points- procedural code oriented approach-   COCOMO. Activity Planning- Objectives- Project schedules- projects and activities- sequencing and scheduling activities- network planning models- formulating a network model- using dummy activities- representing lagged activities- adding time dimension- forward pass- backward pass- identifying the critical path- Activity float- shortening project duration – identifying critical activities-precedence networks

Unit-III: Risk Management- nature of risk- managing- identification-analysis- reducing- evaluating- z values. Resource allocation- nature of resources- requirements-scheduling- critical paths- counting the cost-resource schedule- cost schedule- scheduling sequence. Monitoring and control- creating the frame work- collecting the data- visualizing the progress- cost monitoring-earned value- prioritizing monitoring-Change control.

Unit-IV: Managing contracts- types of contract- stages in contract placement- terms of a contract-contract management- acceptance. Managing people and organizing teams- organizational behaviour background- selecting the right person for the job- instruction in the best methods-motivation- decision making-leadership-organizational structures. Software quality- importance- defining –ISO9126- practical measures- product versus process quality management- external standards-techniques to help enhance software quality

Unit-V: Small projects- some problems- content of a project plan. PRINCE 2- an overview- BS6079:1996- an overview - Euro method- an overview

Books for Study:

4. Bob Hughes and Mike Cotterell – Software project management-second edition- McGraw Hill.
5. Walker Royce - Software Project Management - Addison Wesley.
6. Agarwal, Bharat Bhushan, and Sumit Prakash Tayal. *Software Project Management*. Laxmi Publications, 2011.

 E-learning resources
   1) http://www.bcnn.net