MCA Syllabus

Faculty of Management

University of Pune

University of Pune

Syllabus for Masters of Computer Application

For Academic Year 2015-2017

MCA (Part I) From Academic Year 2015-2016
MCA (Part II) From Academic Year 2015-2016 (If required)
MCA (Part III) From Academic Year 2016-2017

(I) Introduction:
1. The name of the programme shall be Master of Computer Application (M.C.A)
2. The knowledge and skills required planning; designing to build Complex Application Software Systems. These are highly valued in all industry sectors including business, health, education and the arts. The basic objective of the education of the Masters programme in Computer Application (M.C.A) is to provide to the country a steady stream of the necessary knowledge, skills and foundation for acquiring a wide range of rewarding careers into the rapidly expanding world of the Information Technology.

3. The new Curricula would focus on learning aspect from three dimensions viz. Conceptual Learning, Skills Learning and Practical / Hands on with respect to three specialized tracks viz. 1. Software and Application Development 2. Infrastructure and Security Management 3. Information Management & Quality Control.

4. The M.C.A. programme will be a full-time three years Master's Degree Course of Computer Applications. In Second year the students can choose one of the three specialized tracks.Once a student selects a track for a semester, he/she isnot allowed to change the track for that semester,although he/she is allowed to change the track for the next semester if he/she wishes to change.Thus it is important for the Institute to guide the students for selecting the track.

5. The need for Specialization / Specialized tracks
   ➢ The curriculum is designed to cater to the challenging opportunities being faced in Information Technology.
   ➢ The specialization approach would help students to develop basic and advanced skills in areas of their interest thereby increasing their level of expertise. This would further promote the Masters programme in focused areas and result in development of expert skills as per the demands of career opportunities.
   ➢ The specialization approach may in future be open to more areas of specialization and hence make this programme successful in academia as well as in Industry.
   ➢ The first year of the specialized course has taken into consideration all fundamental areas and aspects of technical and management training required for this programme. A good mix of computer related courses use microcomputers to introduce standard techniques of programming; the use of software packages such as databases and programming languages for developing applications; system analysis and design tools. The general business courses include the functional areas of management like information systems and decision support systems and engineering aspects of software development

6. The Job Opportunities are
   ➢ Many graduates begin their career at a junior level but are not in a position to map their job with expert technical skills obtained from a usual programme. The

specializedprogram would enhance their exposure to variety of roles and responsibilities they can take up in any areas of expertise. For eg: In the area of software development they could take up responsibilities in areas of database, product development, product maintenance and support in addition to management activities.

➢ Focused grooming would also make it easier for the IT industry to decide which graduate could be mapped to the right domain.

➢ Enabling entrepreneurship is also the need of the hour and students interested to be on their own could leverage from the newly designed focused programme for entrepreneurs. It will build right platform for students to become successful Software professional. This would emphasize on domain knowledge of various areas.

7. The Institutes should organize placement programme for the M.C.A students, by interacting with the industries and software consultancy houses in and around the region in which the educational Institution is located.

8. At the end of the syllabus various certifications possible for each Semester is given in the list. Students should try to do maximum certifications in their learning phase only to make their resume rich.

9. Ordinarily, in each class, not more than 60 students will be admitted.

(II) (A) Eligibility for Admission:

The eligibility criteria for admission for the MCA course will be as decided by the Competent Authority (Director, Technical Education-Government of Maharashtra, &/or AICTE, New Delhi)

1. A candidate who has either passed with minimum 50% of marks in theaggregate (45% in case of candidate who is domiciled in Maharashtra andbelongs to the reserved categories i.e. S.C., S.T., D.T., N.T., O.B.C., S.B.C.)

   or

   appeared at the final year examination of a post 10+2 course of minimum three years duration leading to an award of Bachelor's Degree, in any discipline by the Association of Indian Universities or has passed with minimum 45% of marks in the aggregate (45% in case of candidate who is domiciled in Maharashtra and belongs to the reserved categories) or appeared at an examination considered equivalent there to would be treated as eligible for Common Entrance Test(CET). Also the candidate must have passed mathematics/Business Mathematics & Statistics paper for 10+2 or graduation Level and Passed the CET conducted by Director of Technical Education MS with nonzero score for that year OR Passed the CET conducted by State level MCA Association with non-zero score for that year, Or Passed the AIMCET exam for that year.

2. However, a candidate would not be treated as eligible for admission to the MCA programme unless he/she passes his/her qualifying examination with requisite percentage on or before 30th September of the concerned academic year and also passes in the CET.

3. Admission to Direct Second Year (Separate Division & Lateral Entry) : The candidates who have passed Bachelor of Computer Application (BCA) ,Bachelor of Computer Science (BCS), Bachelor of Science (Computer/Information Technology) degree courses shall be eligible for Final Year / Second Year of three-year Full time Post Graduate Degree Course in MCA.

Generally, candidate passing all the papers that are generally covered over a period of minimum three years in one sitting are not considered eligible. Likewise, candidates possessing the qualifying degree although with requisite percentage of marks, whose duration is less than three years, are not considered eligible.

(B) Reservation of Seat:

The percentage of seat reserved for candidates belonging to backward classes only from Maharashtra State in all the Government Aided, Un-aided Institutions/Colleges and University Departments is as given below:

a)	Scheduled caste and Scheduled caste convert to Buddhism	13.0%
b)	Scheduled Tribes including those living outside specified areas	10.5%
c)	Vimukta Jain	(14 as specified)
d)	Nomadic Tribes (NT1)(28 before 1990 as specified)	2.5%
e)	Nomadic Tribes (NT2)(Dhangar as specified)	2.5%
f)	Nomadic Tribes (NT3)(Vanjari as specified)	2.5%
g)	Other Backward Class	19.0%
	Total	50.0%

1. Candidate claiming to belong to categories mentioned against (e),(f) and (g) above will have to furnish certificate from appropriate authority that the candidate's parents do not belong to Creamy Layer as per the relevant orders of the Government.
2. If any of the (a) to (g) categories mentioned above does not get the required number of candidates for the percentage laid down in a University area, the seats so remaining vacant shall be filled in from among the candidates of remaining reserved categories with reference to the inter-se-merit of all candidates belonging to the reserved categories from the same University area. However, the total reservation shall not exceed 50%. After doing so the seats remaining vacant shall be filled in with reference to inter-se-merit of all the candidates from the same University area.

(C) Selection Basis:
The selection would be done as per the guidelines given by the Director of Technical Education Maharashtra State time to time.

(III) Number of Lectures and Practical:
Lectures and Practical should be conducted as per the scheme of lectures and practical indicated in the course structure where one session is of 1 hr 30 min, though it is up to the individual Institute to decide the time for one session while designing the time table.

Practical Training and Project Work:
At the end of the sixth semester of study, a student will be examined in the course" Project Work".

1. The Major Project work will be started in Semester V. It may be done individually or in groups in case of bigger projects. However if project is done in groups, each student must be given a responsibility for a distinct module and care should be taken to see the progress of individual modules is independent of others.

2. Students should take guidance from an internal guide and prepare a Project Report on "Project Work" in 2 copies to be submitted to the Director of the Institute. Wherever possible, a separate file containing source-code listings should also be submitted. Every student should also submit soft copy of their project synopsis. Their respective Institutes should forward the copy of this synopsis to the external panel members, in advance of the project viva dates if asked for.
3. The Project Synopsis should contain an Introduction to Project, which should clearly explain the project scope in detail. Also, Data Dictionary, ERDs, File designs and a list of output reports should be included if required as per the project title and scope .
4. The project Work should be of such a nature that it could prove useful or be relevant from the commercial/management angle.
5. The project report will be duly accessed by the internal guide of the subject and marks will be communicated by the Director to the University along with the marks of the internal credit for theory and practical to be communicated for all other courses.
6. The project report should be prepared in a format prescribed by the University, which also specifies the contents and methods of presentation.
7. The major project work carry 250 marks for internal assessment and 250 marks for external viva. The external viva shall be conducted by a minimum of one external examiner. The mini project work would be departmental.
8. Project work can be carried out in the Institute or outside with prior permission of the Institute.
9. Project viva-voce by the University panel will be conducted in the month of April-May.

(IV) Choice Based Credit System

Choice Based Credit System (CBCS) offers wide ranging choice for students to opt for courses based on their aptitude and their career goals. CBCS works on the   fundamental premise that students are mature individuals, capable of making their own decisions.

CBCS enables a student to obtain a degree by accumulating required number of credits prescribed for that degree. The number of credits earned by the student reflects the knowledge or skills acquired him / her. Each course is assigned a fixed number ofcredits based on the contents to be learned & the expected effort of the student. The grade points earned for each course reflects the student's proficiency in that course. CBCS is a process of evolution of educational reforms that would yield the result in subsequentyears and after a few cycles of its implementation.

A. Key features of CBCS:

1. **Enriching Learning Environment:** A student is provided with an academically rich, highly flexible learning system blended with abundant provision for skill development and a practical orientation that he/she could imbibe without sacrificing his/her creativity. There is a definite movement away from the traditional lectures and written examination.

2. **Continuous Learning & Student Centric Concurrent Evaluation:** CBCS makes the learning process continuous. Likewise the evaluation process is not only made continuous but also made learner-centric. The evaluation is designed to recognize the capability and talent of a student.

3. **Active Student-Teacher Participation:** CBCS leads to quality education with active teacher student participation. This provides avenues to meet student's scholastic needs and aspirations.

4. **Industry Institute Collaboration:** CBCS provides opportunities for meaningful collaboration with industry and foreign partners to foster innovation, by introduction of electives and half credit courses through the cafeteria approach. This will go a long way in capacity building of students and faculty.

5. **Interdisciplinary Curriculum:** Cutting edge developments generally occur at the interface of two or more discipline. The interdisciplinary approach enables integration of concepts, theories, techniques, and perspectives from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline.

6. **Employability Enhancement:** CBCS shall ensure that students enhance their skill/employability by taking up project work , entrepreneurship and vocational training

7. **Faculty Expertise:** CBCS shall give the Institutes the much needed flexibility to make best use of the available faculty expertise.

B. Pre-requisites for successful implementation of CBCS

The success of the CBCS also requires certain commitments from both the students and the teachers.

1. The student should be regular and punctual to his classes, studious in carrying out the assignments and should maintain consistency in his tempo of learning. He should make maximum use of the available library, internet and other facilities.

2. The teachers are expected to be alert and punctual and strictly adhere to the schedules of teaching, tests, seminars, evaluation and notification of results.

3. All teachers should notify the tentative schedule of teaching and tests of the entire semester, including the dates of tests, dates of score notification and all other schedules, which can be planned in advance.

4. The teachers are expected to adhere to unbiased and objective evaluation and marking of concurrent evaluation scores (internal examinations) which will not only maintain the confidence of the students, but, at the same time, ensure that merit is given due credit.

5. Transparency, objectivity and quality are the key factors that will sustain a good CBCS system.

6. At the post-graduate level, and in a professional programme, the syllabus is to be looked upon as the bare minimum requirement to be fulfilled and sufficient emphasis shall be laidon contemporary aspects, going beyond the syllabus.

C. Credits

Credit: The definition of 'credits' can be based on various parameters - such as the learning hours put in, learning outcomes and contact hours, the quantum of content/syllabus prescribed for the course.

Each course is assigned a certain credit, depending on the estimated effort put in by a student. When the student passes that course, he/she earns the credits associated with that course.

In the Credit system the emphasis is on the **hours put in by the learner and not on the workload of the teacher.** Each credit can be visualized as a combination of **3 components viz. Lecture (L) + Tutorials (T) + Practice (Practical / Project Work) (P) i.e. LTP Pattern.**

The effort of the learner for each Credit Point may be considered to have two parts:

a) One part consisting of the hours actually spent in class room / practical / field work instructions and
b) The other part consisting of notional hours spent by the Learner in self-study, in the library, peer interactions, case study, writing of journals and assignments, projects etc. for the completion of that course.

Every course offered shall have three components associated with the teaching-learning process of the course, viz.
   a) **Lecture (L):** Classroom sessions delivered by faculty in an *interactive mode*
   b) **Tutorial (T):** Session consisting of 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 sessions
   c) **Practice (P):** Practice session /Practical / Project Work consisting of Hands-on experience / Field Studies / Case studies that equip students to acquire the much required *skill component*.

The teaching / learning as well as evaluation are to be interpreted in a broader perspective as follows:
   a) Teaching – Learning Processes: Classroom sessions, Group Exercises, Seminars, Small Group Projects, Self-study, etc.
   b) Evaluation: Tutorials, Class Tests, Presentations, Field work, Assignments, Research papers, Term papers, etc.

In terms of credits, for a period of one semester of 15 weeks:
   a) *every ONE hour session per week of L amounts to 1 credit per semester*
   b) *a minimum of TWO hours per week of T amounts to 1 credit per semester,*
   c) *a minimum of TWO hours per week of P amounts to 1 credit per semester,*
A course shall have either or all the three components, i.e. a course may have only lecture component, or only practice component or a 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 a course are 'L + T + P'. The *credit pattern* of the course is indicated as L: T: P.

If a course is of 3 credits then the different credit distribution patterns in L:T: P format could be 3:0: 0,   1:2: 2,   2: 0: 2,   2: 2: 0, etc. The credits of a course cannot be greater than the number of hours (per week for 15 weeks) allotted to it.

Full Credit Course: A course with weightage of 4 credits is considered as a full credit course.
Half Credit Course: A course with weightage of 2 credits is considered as a half credit course.

The MCA programme is a combination of:
  a) Full Credit Courses (100 Marks each) : 4 Credits each
  b) Half Credit Courses (50 Marks each) : 2 Credits each

D. Adoption of Credit and Grading System

As per national policy and international practices, it is proposed to adopt the Credit and Grading System for the MCA programme w.e.f. AY 2013-14.

D-1 Rationale for adoption of the Credit and Grading System:

  a) **Learner's Perspective**: The current practice of evaluation of student's performance at the end of a semester is flawed. The students are expected to express their understanding or mastery over the content included in their curriculum for a complete semester within a span of three hours and their efforts over the semester are often completely ignored. It also promotes unhealthy practice of cramming before the examinations and focusing on marks rather than on learning.

  b) **Evaluation Perspective**: The present system of evaluation does not permit the flexibility to deploy multiple techniques of assessment in a valid and reliable way. Moreover, the current practice of awarding numerical marks for reporting the performance of learners suffers from several drawbacks and is a source of a variety of errors. Further, the problem gets compounded due to the variations in the marks awarded in different subjects. **The 'raw score' obtained by the learner, is, therefore, not a reflection of his true ability.**

  In view of the above lacunae, it is desirable that the marking system used for the declaration of results is replaced by the grading system. The system of awarding grades provides a more realistic picture of learner's ability than the prevailing marking system. Excellence in quality education can be achieved by evaluating the true ability of the learners with the help of continuous evaluation.

D-2 Salient features of the grading system:

  1. In this system, students (learners) are placed in ability bands that represent a range of scores. This ability range may be designated with alphabetical letters called as '**GRADE**'.

  2. Grading reflects an individual learner's performance in the form of a certain *level of achievement.*

  3. The Grading system ensures natural classification in qualitative terms rather than quantitative terms since it expresses a range /band of scores to which a learner belongs such as O,A,B,C,D,E & F

4. Grades can be interpreted easily and directly and can be used to prepare an accurate '*profile*' of a learner.

5. A properly introduced grading system not only provides for a comparison of the learners' performance but it also indicates the quality of performance with respect to the amount of efforts put in and the amount of knowledge acquired at the end of the course by the learners.

D-3 Basics of Credit and Grading System

Grading is a method of reporting the result of a learner's performance subsequent to his evaluation. It involves a set of alphabets which are clearly defined and designated and uniformly understood by all the stakeholders.

Grading is carried out in a variety of ways. The classification of grades depends upon the reference point.

With 'Approach towards Grading' as the reference point, Grading may be classified as:
a) **Direct grading**: When the performance exhibited by the examinees is assessed in qualitative terms and the impressions so obtained by the examiners are directly expressed in terms of letter grades, it is called, '*Direct Grading*'.
b) **Indirect grading**: When the performance displayed by the examinees is first assessed in terms of marks and subsequently transformed into letter grades by using different modes, it is called, '*Indirect Grading*.'

With 'Standard of Judgment', as the reference point Grading may be classified as:
a) **Absolute grading**: The method that is based on a predetermined standard which becomes a reference point for the learner's performance is called 'Absolute Grading'. This involves direct conversion of marks into grades irrespective of the distribution of marks in a subject.
b) **Relative grading**: Relative Grading is popularly known as grading on the curve. The curve refers to the normal distribution curve or some symmetric variant of it. This method amounts to determining in advance approximately what percentage of learners can be expected to receive different grades, such as O,A,B,C,D,E,F. In this grading system the grade is not determined by the learner's performance but on the basis of group performance.

Absolute grading has several advantages such as:
a) The procedure is simple and straightforward to use,
b) Each grade is distinctly understandable,
c) The learner has the freedom to strive for the attainment of the highest possible grade and
d) It enables the learners to know their strengths and weaknesses.

The few limitations of Absolute Grading method are:
a) The distribution of scores is taken at its face value regardless of the errors of measurement creeping in due to various types of subjectivity.
b) Besides, the cut-offs of different categories are also arbitrarily decided.

It is proposed to use the **Indirect and Absolute Grading System for the MCA programme** i.e. the assessment of individual Courses in the concerned examinations will be on the basis of marks. However the marks shall later be converted into Grades by a **defined mechanism** wherein the overall performance of the learners can be reflected after considering the Credit Points for any given course. The **overall evaluation shall be designated in terms of Grade.**

E. Session Duration:

Each teaching-learning, evaluation session shall be of 90 minutes. However, institutes shall have the flexibility to define their time slots in a manner as to use their faculty and infrastructure resources in the best possible way.

F. Courses Offered:

Institutes are free to offer atleast two specialized tracks. It is envisaged that Institutes offer only those tracks /electives for which they have the required faculty competencies and relevant resources.

It shall be mandatory for the Institutes to provide all information relating to the specialized tracks offered, their respective credits, evaluation pattern, etc. to all the students so as to enable them to make an informed choice. Such information should be hosted on the website/prospectus of the Institute in sufficient advance, prior to commencement of the classes. Other information such as the credits, the prerequisites, and syllabus shall also be hosted on the website of the institute.

G. Registration:

Such registration shall be the basis for a student to undergo concurrent evaluation, online evaluation and end semester examination. Application forms for University examinations are to be filled up based on the choices finalized during the registration process and submitted to the University along with the prescribed examination fee.

G-1 Registration Process:

Each student, on admission shall be assigned to a *Faculty Advisor* who shall advise her/him about the academic programs and counsel on the choice of courses considering the student's profile and career objectives.

    i.   With the advice and consent of the Faculty Advisor the student shall register for a set of courses he/she plans to take up for the Semester.

    ii.   The student should meet the criteria for prerequisites, if defined for a course, to become eligible to register for that course.

    iii.   The Institute shall follow a selection procedure on a first come first served basis, determining the maximum number of students and counseling the students if required to avoid overcrowding to particular course(s) at the expense of some other courses.

    iv.   It is expected that a student registers for 27 credits in Semester I, II,III,IV,V and 25 Credits in Semester VI.

    v.   The maximum number of students to be registered in each specialized track shall depend upon the physical facilities available. Every effort shall be made by the Institute to accommodate as many students as possible.

    vi.   The Institute may not offer a specialized track if a minimum of 33% of students are not registered for that course.

(V) Assessment:

In total 160 credits represent the workload of a year for MCA program.
Total credits=160, 1 credit = 15 lecture Hrs,   100 Marks   Subject = 4 Credits

Semester – I	27 credits
Semester – II	27 credits
Semester – III	27 credits
Semester – IV	27 credits
Semester – V	27 credits
Semester – VI	25 credits

Credit hours are based on the number of "contact hours" per week in class, for one term; formally, Semester Credit Hours. One credit will represent 12 to 15 teaching hours depending on technical and management subjects.

The final total assessment of the candidate is made in terms of an internal (concurrent) assessment and an external (university) assessment for each course.In total the internal(concurrent) to external(university) marks ratio is maintained 50 : 50.

In general
1. For each paper, 30% marks will be based on internal assessment and 70% marks for semester and examination (external assessment), unless otherwise stated.
2. The division of the 30marks allotted to internal assessment of theory papers is on the basis of tutorial paper of 15 marks and seminars, presentations and attendance of 15 marks.
3. The marks of the practical would be given on internal practical exam & oral.
4. The internal marks will be communicated to the University at the end of each semester, but before the semester-end examinations. These marks will be considered for the declaration of the results.

(VI) Examination:
Examinations shall be conducted at the end of the semester i.e. during November and in April/May. However supplementary examinations will also be held in November and April/May.

VI-A

Concurrent Evaluation: A continuous assessment system in semester system (also known as internal assessment/comprehensive assessment) is spread through the duration of course and is done by the teacher teaching the course.

The continuous assessment provides a feedback on teaching learning process. The feedback after being analyzed is passed on to the concerned student for implementation and subsequent improvement. As a part of concurrent evaluation, the learners shall be *evaluated on a continuous basis* by the Institute to ensure that student learning takes place in a graded manner.

Concurrent evaluation components should be designed in such a way that the faculty can *monitor the student learning & development and intervene wherever required*. The faculty *must share the outcome* of each concurrent evaluation component with the students, soon after the evaluation, and guide the students for betterment.

Individual faculty member shall have the flexibility to design the concurrent evaluation components in a manner so as to give a balanced assessment of student capabilities across Knowledge, Skills & Attitude (KSA) dimensions based on variety of assessment tools.

Suggested components for Concurrent Evaluation (CE) are:

1. Case Study / Caselet / Situation Analysis – (Group Activity or Individual Activity)
2. Class Test
3. Open Book Test
4. Field Visit / Study tour and report of the same
5. Small Group Project & Internal Viva-Voce
6. Learning Diary
7. Scrap Book
8. Group Discussion
9. Role Play / Story Telling
10. Individual Term Paper / Thematic Presentation
11. Written Home Assignment
12. Industry Analysis – (Group Activity or Individual Activity)
13. Literature Review / Book Review
14. Model Development / Simulation Exercises – (Group Activity or Individual Activity)
15. In-depth Viva
16. Quiz

There shall be *a minimum of three concurrent evaluation components per full credit course and five concurrent evaluation components for each half credit course*. The faculty shall announce in advance the units based on which each concurrent evaluation shall be conducted. Each component shall ordinarily be of 10 marks. The Institute shall however have the liberty to conduct additional components (beyond three/five). However the total outcome shall be scaled down to 30/50 marks for full credit and half credit courses respectively.Marks for the concurrent evaluation must be communicated by the Institute to the University as per the schedule declared by the University. Detailed record of the Concurrent Evaluation shall be maintained by the Institute. The same shall be made available to the University, on demand.

At the end of Concurrent Evaluation (out of 30/50 marks) the student does NOT have a facility of Grade Improvement, if he/she has secured any grade other than F.

VI-B

Safeguards for Credibility of Concurrent Evaluation: The following practices are encouraged to enhance transparency and authenticity of concurrent evaluation:

a) Involving faculty members from other management institutes.
b) Setting multiple question paper sets and choosing the final question paper in a random manner.
c) One of the internal faculty members (other than the course teacher) acting as jury during activity based evaluations.
d) Involvement of Industry personnel in evaluating projects / field based assignments.
e) Involvement of alumni in evaluating presentations, role plays, etc.
f) 100% moderation of answer sheets, in exceptional cases.

(VII) Standard of Passing:

1. Every candidate must secure atleast Grade D in Concurrent Evaluation as well as University Examination as separate heads of passing for each course. Internal as well as external examination will be held in November and April/May.

Conversion of Marks to Grade Points & Grades: The marks shall be converted to grade points and grades using Table I below.

Table I: Points Grading System
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Sr. No.	Marks	Grade	Grade Point
1	100 – 75	O – Outstanding	06
2	74 – 65	A – Very Good	05
3	64 -55	B – Good	04
4	54 – 50	C – Average	03
5	49 – 45	D – Satisfactory	02
6	44 – 40	E – Pass	01
7	39 – 0	F – Fail	00

(VIII) Reassessment of Internal Marks:

In case of those who have secured less than passing percentage of marks in internal i.e. less than 40%, the institute will administer a separate internal test.The results of which may be conveyed to the University as the Revised Internal Marks.

In case the result of the revised internal test is lower than the original marks then the original marks will prevail. In short, the rule is higher of the two figures should be considered.

However, the institute will not administer any internal test, for any subject for those candidates who have already secured 40% or more marks in the internal examination.

(IX) Backlog:

Candidates can keep terms for any semester of M.C.A., irrespective of the number of subjects in which he/she has failed in the previous MCA semester examinations.

(X) Board of Paper Setters /Examiners:

For each Semester and examination there will be one board of Paper setters and examiners for every course. While appointing paper setter /examiners, care should be taken to see that there is at least one person specialized in each unit course.

(XI) Class:

The performance of a student will be evaluated in terms of two indices

a) *Semester Grade Point Average (SGPA)* which is the Grade Point Average for a semester
b) *Cumulative Grade Point Average (CGPA)* which is the Grade Point Average for all the completed semesters at any point in time.

Semester Grade Point Average (SGPA): At the end of each semester, SGPA is calculated as the weighted average of GPI of all courses in the current semester in which the student has passed, the weights being the credit values of respective courses.

SGPA = Grade Points divided by the summation of Credits of all Courses.
$$\sum \{C * GPI\}$$

$$\text{SGPA} = \text{-------------------}\text{for a semester.}$$
$$\sum C$$

Where GPI is the Grade and C is credit for the respective Course.

Cumulative Grade Point Average (CGPA): Cumulative Grade Point Average (CGPA) is the grade point average for all completed semesters. CGPA is calculated as the weighted average of all GPI of all courses in which the student has passed up to the current semester.

Cumulative Grade Point Average (CGPA) for the Entire Course

$$\text{SGPA} = \frac{\sum \{C * GPI\}}{\sum C} \qquad \text{for all semesters taken together.}$$

Where GPI is the Grade and C is credit for the respective Course.

IMPORTANT NOTE:
If a student secures F grade in either or both of Concurrent Evaluation or University Evaluation for a particular course his /her credits earned for that course shall be ZERO.

Award ofGrade Cards: The University of Pune under its seal shall issue to the learners a grade card on completion of each semester. The final Grade Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme for obtaining the degree.

Final Grades: After calculating the SGPA for an individual semester and the CGPA for entire programme, the value shall be matched with the grade in the Grade Points & Descriptors Table as per the Points Grading System and expressed as a single designated GRADE (as per Table II) such as O,A, B, etc....

Table II: Grade Points & Descriptors

Sr. No.	Marks	Grade	Grade Point
1	100 – 75	O – Outstanding	06
2	74 – 65	A – Very Good	05
3	64 -55	B – Good	04
4	54 – 50	C – Average	03
5	49 – 45	D – Satisfactory	02
6	44 – 40	E – Pass	01
7	39 – 0	F – Fail	00

The description of the final grades shall be as follows:

O: Outstanding (Excellent Analysis of the topic - 75% and above)
Accurate knowledge of the primary material, wide range of reading, logical development of ideas, originality in approaching the subject. Neat and systematic organization of content, elegant and lucid style.

A: Very Good (Excellent Analysis of the topic - 65 to 74 %)

Accurate knowledge of the primary material, acquaintance with seminal publications, logical development of ideas. Neat and systematic organization of content, effective and clear expression.

B : Good (Good Analysis and treatment of the topic - 55 to 64 %)
Basic knowledge of the primary material, logical development of ideas. Neat and systematic organization of content, effective and clear expression.

C : Average (Some important points covered – 50 to 54%)
Basic knowledge of the primary material, logical development of ideas. Neat and systematic organization of content, good language or clear expression.

D: Satisfactory (Some points discussed – 45 to 49%)
Basic knowledge of the primary material, some organization of content, acceptable language or expression.

E: Pass (Any two of the above – 40 to 44%)

F: Fail (None of the above – 0 to 39%)

A student who secures grade E or above in a course is said to have completed /earned the credits assigned to the course. A student who completed the minimum credits required for the MCA programme shall be declared to have completed the programme.

NOTE:
The Grade Card for the final semester shall indicate the following, amongst other details:
a) Grades for concurrent and university evaluation, separately, for all courses offered by the student during the entire programme along with the grade for the total score.
b) SGPA for each semester.
c) CGPA for final semester.
d) Total Marks Scored out of Maximum Marks for the entire programme, with break up of Marks Scored in Concurrent Evaluation and University Evaluation.
e) Marks scored shall not be recorded on the Grade Card for intermediate semesters.
f) The grade card shall also show the 10-point scale and the formula to convert GPI, SGPA, and/or CGPA to percent marks.

(XII) Scaling Down of Concurrent Evaluation Scores:

The marks obtained by the student for the Concurrent Evaluation components conducted by the Institute (i.e. out of 30 marks), in the Full Credit Courses, in Semester I to Semester VI, shall be scaled down, to the required extent, if percentage of the marks of Concurrent Evaluation exceeds the percentage of marks scored in the end semester University Examination by 25% for the respective course. i.e. (percentage of marks scored out of 30 in concurrent evaluation) – (percentage of marks scored out of 70 in university evaluation) should not exceed 25%.

The marks obtained by the student in Half Credit Courses are **not subject to** scaling down. Likewise, the marks obtained by the student in Concurrent Evaluation for the Major Industry Project shall **not be** subjected to scaling down.

(XIII) Medium of Instruction:

The medium of Instruction will be English.

(XIV) Clarification of Syllabus:

It may be necessary to clarify certain points regarding the course. The syllabus Committee should meet at least once in a year to study and clarify any difficulties from the Institutes.

(XV) Revision of Syllabus:

As the computer technology is changing very fast, revision of the syllabus should be considered every 3 years.

(XVI) Attendance:

The student must meet the requirement of **75% attendance per semester per course** for grant of the term. The Director shall have the right to withhold the student from appearing for examination of a specific course if the above requirement is not fulfilled.

Since the emphasis is on continuous learning and concurrent evaluation, it is expected that the students study all-round the semester. *Therefore, there shall not be any preparatory leave before the University examinations.*

(XVII) ATKT Rules:

A student shall earn the credits for a given course in **MAXIMUM FOUR ATTEMPTS**.

(XVIII) Maximum Duration for completion of the Programme:

The candidates shall complete the MCA Programme **WITHIN 5YEARS** from the date of admission, by earning the requisite credits. The student will be finally declared as failed if she/he does not pass in all credits within a total period of four years. After that, such students will have to seek fresh admission as per the admission rules prevailing at that time.

MCA SYLLABUS STRUCTURE 2015-2018

SEMESTER I

Subject Title	Subject Code	CP	EXT	INT
1. Fundamentals of Computer	IT11	4	70	30
2. C Programming with Data Structure	IT12	4	70	30
3. Software Engineering	IT13	4	70	30
4. Database Management System	IT14	4	70	30
5. Principles and Practices of Management and Organizational Behavior	BM11	4	70	30
6. Business Process Domains*	BM12	2		70
Practical*				
7. C and DS Lab	IT12L	2		50
8. DBMS Lab	IT14L	2		50
Soft Skills *				
9. Word Power	SS11	1		30
Semester I Total Marks			**E**	**I**
		27	**350**	**350**

SEMESTER II

Subject Title	Subject Code	CP	Ext.	Int.
1. Essentials of Operating System	IT21	4	70	30
2. Web Technologies	IT22	4	70	30
3. Core Java	IT23	4	70	30
4. Essentials of Networking	IT24	4	70	30
5. Discrete Mathematics	MT21	4	70	30
6. Essentials of Marketing	BM21	2		70
Practical *				
7. Mini Project using Web Technology	IT22L	2		50
8. Core Java Lab	IT23L	2		50
Soft Skills *				
9. Oral Communication	SS21	1		30
Semester II Total Marks			**E**	**I**
		27	**350**	**350**

SEMESTER III				
Subject Title	**Subject Code**	**CP**	**Ext.**	**Int.**
COMMON SUBJECT FOR ALL TRACKS FOR SEMESTER III				
1. Probability and Combinatorics	MTC31	4	70	30
2. Multimedia Tools for Presentation*	ITC31	2		70
3. Soft Skills-Presentation *	SSC31	1		30
TRACK I : SOFTWARE & APPLICATION DEVELOPMENT				
4. Advanced Data Structure and C++ programming	T1-IT31	4	70	30
5. Design and Analysis ofAlgorithms (DAA)	T1-IT32	4	70	30
6. Object Oriented Analysis and Design	T1-IT33	4	70	30
7. Advanced Internet Technology	T1-IT34	4	70	30
Practical*				
8. DS & C++ Lab	T1-IT31L	2		50
9. Mini Project using AIT	T1-IT34L	2		50
TRACK II :INFRASTRUCTURE & SECURITY MANAGEMENT				
4. IT Infrastructure Architecture	T2-IT31	4	70	30
5. Data Centre Architecture & Storage Management	T2-IT32	4	70	30
6. Introduction to Information Security	T2-IT33	4	70	30
7. Office Automation Tools	T2-IT34	4	70	30
Practical*				
8. Mini Project on IT Architecture and Information Security	T2-IT31L	2		50
9. Office Automation Tools – Lab	T2-IT34L	2		50
TRACK III : INFORMATION MANAGEMENT & QUALITY CONTROL				
1. Enterprise Resource Planning	T3-IT31	4	70	30
2. Data Communication & Computer Networks	T3-IT32	4	70	30
3. Data Warehouse, Mining, BI Tools& applications	T3-IT33	4	70	30
4. Information Security & Audit	T3-IT34	4	70	30
Practical*				
5. DCCN Lab	T3-IT32L	2		50
6. BI Tools Lab	T3-IT33L	2		50
TRACK IV :NETWORKING				
7. Network Administration I	T4-IT31	4	70	30
8. Windows Server Configurations	T4-IT32	4	70	30
9. IT Infrastructure Architecture	T4-IT33	4	70	30
10. Linux Administration I	T4-IT34	4	70	30
Practical*				
11. Network Administration Lab – I	T4-IT31L	2		50
12. Server Configuration Lab (Windows and Linux)	T4-IT32L	2		50

SEMESTER IV				
Subject Title	**Subject Code**	**CP**	**Ext.**	**Int.**
COMMON SUBJECT FOR ALL TRACKS FOR SEMESTER IV				
1. Optimization Techniques	ITC41	4	70	30
2. Research Methodology & Statistical Tools	ITC42	2		70
3. Soft Skills -Interview	SSC41	1		30
TRACK I : SOFTWARE & APPLICATION DEVELOPMENT				
4. Advanced Java	T1-IT41	4	70	30
5. Python programming	T1-IT42	4	70	30
6. Advance DBMS	T1-IT43	4	70	30
7. Cloud Computing	T1-IT44	4	70	30
Practical *				
8. Adv. Java Lab	T1-IT41L	2		50
9. Python Programming Lab	T1-IT42L	2		50
TRACK II :INFRASTRUCTURE & SECURITY MANAGEMENT				
4. Identity and Access Management	T2-IT41	4	70	30
5. IT Advisory Services	T2-IT42	4	70	30
6. Infrastructure Security Audit	T2-IT43	4	70	30
7. Enterprise Solutions Architecture	T2-IT44	4	70	30
Practical *				
8. Identity and Access Management Lab	T2-IT41L	2		50
9. Mini Project on IT Advisory Services and Enterprise Solutions Architecture	T2-IT42L	2		50
TRACK III : INFORMATION MANAGEMENT & QUALITY CONTROL				
4. E Commerce & Knowledge Management	T3-IT31	4	70	30
5. Cyber Laws & Intellectual Property Rights	T3-IT32	4	70	30
6. Customer Relationship Mgmt& Supply Chain Mgmt	T3-BM33	4	70	30
7. Software Quality Assurance & Control	T3-IT34	4	70	30
Practical*				
8. Mini Project based on CRM & SCM	T3-IT33L	2		50
9. Software Quality Assurance Lab	T3-IT34L	2		50
TRACK IV :NETWORKING				
4. Network Administration II	T4-IT31	4	70	30
5. Internet of Things	T4-IT32	4	70	30
6. Linux Administration II	T4-IT33	4	70	30
7. Wireless Networks	T4-IT34	4	70	30
Practical*				
8.Virtulization Lab	T4-IT31L	2		50
9.Wireless Network Lab	T4-IT34L	2		50

SEMESTER V				
Subject Title	**Subject Code**	**CP**	**Ext.**	**Int.**
COMMON SUBJECT FOR ALL TRACKS FOR SEMESTER V				
1. Software Project Management	ITC51	3	70	
2.Project *	ITC51P	3		100
3.Soft Skills - Group Discussion	SSC51	1		30
TRACK I : SOFTWARE & APPLICATION DEVELOPMENT				
4. ASP .Net using C#	T1-IT51	4	70	30
5. Service Oriented Architecture	T1-IT52	4	70	30
6. Big Data Analytics	T1-IT53	4	70	30
7. Mobile Application Development	T1-IT54	4	70	30
Practical *				
8. Mini Project using ASP .Net	T1-IT51L	2		50
9. Mini Project Using Mobile Application Development	T1-IT54L	2		50
TRACK II :INFRASTRUCTURE & SECURITY MANAGEMENT				
4. Quality verification	T2-IT51	4	70	30
5. Infrastructure Auditing & Implementation	T2-IT52	4	70	30
6. IT Service Management	T2-IT53	4	70	30
7. Digital and e-business Infrastructure Defense	T2-IT54	4	70	30
Practical*				
8. Mini Project on Infrastructure Audit	T2-IT52L	2		50
9. Design of digital and e-business infrastructure and security mechanism	T2-IT54L	2		50
TRACK III : INFORMATION MANAGEMENT & QUALITY CONTROL				
4.Software Testing & Tools	T3-IT51	4	70	30
5.Entrepreneurship Development	T3-IT52	4	70	30
6.Decision Support System	T3-IT53	4	70	30
7.Business Architecture	T3-IT54	4	70	30
Practical *				
8. CASE Tools Lab	T3-IT51L	2		50
9. Activities based on Entrepreneurship Development	T3-IT52L	2		50
TRACK IV :NETWORKING				
4. Network Routing Algorithms	T4-IT51	4	70	30
5. Computer and Network Security	T4-IT52	4	70	30
6. Cloud Architectures and Security	T4-IT53	4	70	30
7. Unified Communication	T4-IT54	4	70	30
Practical *				
8. Computer and Network Security – Lab	T4-IT52L	2		50
9. Cloud Building within Organization (Deployment of open stack / open cloud and cloud based applications)	T4-IT53L	2		50
SEMESTER VI				

Subject Title	Subject Code	CP	Ext.	Int.
COMMON SUBJECTS				
1. Open subject for each track	ITC61	4	70	30
		15	250	
2.Project	ITC61P	6		150

  * : Departmental Subject

CP : Credit Points

Ext. : External Subject

Int. : Internal subject

Hardware and Software Requirements for Semester I and II:

1	Open source IDE for C/C++ Editor/JAVA/Website designing
	Open source application server(s) : WAMP/XAMP etc.
2	Open Source Databases: PostgreSQL/MySQL/SQLite etc.
3	Open Source Accounting Packages: Tally Edu. Mode/GnuCash/LedgerSMB/TurboCASH
4	Open Source office suite : WPS Office Free/SSuite Office/Open Office/ LibreOffice etc.
5	Open source Operating System : Linux (Fedora/Ubuntu) etc.
6	Microsoft Windows 7/8/8.1 for [30 Machines only] [for the batch size 30/60/120]

7	2 Servers are mandatory [One Linux server & One Windows server]
	  • Windows Server : Microsoft Windows Server 2008/2012
	  • Linux Server : Fedora/Ubuntu

Note: Institutes may use any other alternate opensource software.

Hardware Requirements:		
Desktop Computers :	Processor: Dual Core or above	RAM: Min. 2 GB or Above
Server :	Processor: Xeon/equivalent AMD or above	RAM: Min 8 GB or above

Note: NComputing and similar technologies are not recommended

SEMESTER I

Semester I				
Sr. No.	Subject Code	Subject Title	Internal	External
1	IT11	Fundamentals of Computer	30	70

Objective: To give basic knowledge of computer system, it's components and their organization. This will also introduce the basic data representation in the computer.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**Introduction to Digital Computer** 1.1 Concept of Digital Computer 1.2 Types of Software – System software / 1.3 Application software / Utility Software. 1.4 Compilers, Interpreters, Assemblers, Linker,Loader	14	05
2	**Data Representation and Boolean Algebra** 2.1 Binary, Octal, Hexadecimal and their inter-conversion 2.2 1's and 2's complement. 2.3 Binary Arithmetic. & Number Systems – BCD, EBCDIC, ASCII, De-Morgan's Theorem, Duality Theorem, K-Map, Sum of product, Product of Sum, Algebra Rules, Laws, Logic Circuits, NOT,AND, OR, NAND, NOR, XOR, XNOR, Gated diagrams	**15**	06
3	**Combinational Circuits** 3.1 Half / Full Adder 3.2 Decoder / Encoder 3.3 Multiplexer / Demultiplexer,	14	05
4	**Sequential Circuits** 4.1 Flip Flops - SR, D, JK, Master – Slave, Edge Triggered D flipflop with timing diagram 4.2 Shift Registers 4.3 Counters, Synchronous & Asynchronous counter, Binary counter, mod-10counter	**14**	05
5	**Memory System** 5.1 Memory Hierarchy 5.2 Primary Memory – DRAM, SDRAM,DDR, RDRAM. ROM, PROM, EPROM, EEPROM 5.3 Cache memory Structure 5.4 DMA, DMA interfacing with processor	15	05
6	**CPU Organization** 6.1 CPU Building Blocks 6.2 CPU Registers, System bus Characteristics, Interface basics with interface block diagram, concept of local bus with name of different local buses (only types) 6.3 Addressing Modes 6.4 Interrupt Concept, Interrupt types 6.5 Instruction and Execution cycle 6.6 Hardwired and Micro Program control 6.7 RISC vs. CISC 6.8 Pipelining – Data Path, Time Space Diagram, Hazards	28	14

Reference Books
1. Computer Organization & Architecture Carpinell, Pearson
2. Computer System Architecture Morris Man, Pearson, 3rd Edition.
3. Ad. Computer Architecture Kaithwang, Tata McGraw-Hill.
4. Digital Computer Electronics Malvino, Tata McGraw-Hill,4th Edition
5. Micro Computer Systems Yu Cheng Liu & Glann Gibson
6. Digital Electronics By Bartee, Mc-Graw-Hill
7. Introduction to Digital Computer Design V. Rajaraman & Radhakrishnan, PHI
8. Computer Organization and Architecture W. Stalling, Pearson, 8th Edition
9. Intel Micro Processors Barry Brey, Pearson, 7th Edition
10. Computer Organization & Design Pal Chaudhary,PHI, 3rd Edition
11. Microprocessor Architecture Ramesh Gaonkar, Penram International Publishing, 6th Edition.
12. Computer Architecture & Organization J.P. Hayes, McGraw-Hill,3rd Edition
13. Computer Organization Hemchar, Tata McGraw-Hill,5th Edition
14. Digital Logic and Computer Design Morris Mano
15. An Introduction to Intel Family of Processors -James Antonolcos,Pearson,3rd Edition
16. Foundations of computing 3rd Edition Pradeep K. Sinha & Priti Sinha

		Semester I		
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
2	IT12	C Programming with Data Structure	30	70

Objective: This is the first programming language subject student will learn. This subject will teach them programming logic, use of programming instructions, syntax and program structure. This subject will also create foundation for student to learn other complex programming languages like C++, Java etc. By the end of the course students will be able to write C and basic DS programs.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**An Overview of C** 1.1 A Brief History of C 1.2 Features & characteristics of C 1.3 Structure of a 'C' Program 1.4 Program Development Life Cycle 1.5 Complier Vs Interpreters 1.6 Compilation & Execution of C Program On DOS& UNIX, Linux	**3**	1

2	**Variables, Data Types, Operator & Expression**
	2.1 Character Set , C Tokens - Keywords & Identifiers
	         Constants, Integer, Floating Point, Character, String,
	         Enumeration
	2.2 Backslash characters / Escape sequences
	2.3 Data Types in C , Variables- Declaration & Definition, User-Defined Type declarations
	2.4 Operators & Expressions - Arithmetic, Relational, Logical, Increment , Decrement , Bit wise, Assignment, Conditional,
	         Type conversions in Expressions - Implicit Type Conversion, Explicit Type Conversions
	2.5 Precedence & Associability of Operators.
	2.6 Built in I/O Functions - Introduction, Console Input & Output functions, Formatted
	         Input & Output (scanf/printf), sprintf & sscanf
		5	2

3	**Control Statements** 3.1 Introduction 3.2 Selection Statements 3.3 If, Nested if, if….else, else if Ladder 3.4 ternary operator, switch, Nested switch, conditional expression 3.5 Iterative Statements - while loop, do-while loop, for loop, break & continue, 3.6 Jump Statements - Goto & label, 3.7 exit() function 3.8 Compound Statements, Null Statements	5	2
4	**Array & String** 4.1 Single Dimension Arrays - Declaration, Initialization,	8	3

	Accessing array Elements, Memory Representation		
	4.2 Multidimensional Arrays - Declaration, Initialization, Accessing arrayElements, Memory Representation.		
	4.3 String (character array) - Declaration, Initialization, String Manipulation Functions.		
5	**Pointers** 5.1 Introduction- Basics of Pointer, Memory Organization, Application of Pointer, Declaration Of pointer, Initializing Pointer 5.2 Pointer Expressions , De-referencing Pointer Void Pointer, Pointer Arithmetic 5.3 Precedence of &, * operators , Pointer to Pointer, Constant Pointer, 5.4 Pointers and Arrays, Pointers and character string, Array of pointers 5.5 Dynamic Memory Allocation - sizeof(), malloc(), calloc(), realloc(), free()	10	4
6	**Function** 6.1 Introduction - Types of functions , Declaration & Definition, Arguments & local variables 6.2 Parameter passing – Call by value & Call by reference 6.3 Passing arrays, strings to functions, Pointers to functions 6.4 Recursion	8	3
7	**Structure, Union, Enumeration & typedef** 7.1Structures - Declaration and Initializing Structure, Accessing Structure members, Structure Assignments, Array of Structures, Nested structure, Passing Structure to function, Structure Pointer, typedef keyword 7.2 Unions - Declaration and Initializing Union 7.3 Accessing union members, Difference between Structure & Union, Enumerated data type	12	4
8	**Basics of Data Structure** 8.1 Data Structure 8.2 Implementation of Data Structure	2	1

9	**Array as Data Structure**
	9.1Storage Representation of Arrays
	9.2 Applications of Arrays
	9.3 Polynomial Representation Using Arrays
	    Addition of Two Polynomial
	    Multiplication of Two Polynomial
	9.4 Sparse Matrices
	    Addition of Sparse Matrices
	    Transpose of a Sparse Matrix
		5	2

11	**Linked List** 10.1 Introduction & Drawback of Sequential Storage 10.2 Concept of Linked List 10.3 Implementation of Linked List 10.4 Operation of Linked List - Creating a List Displaying a List Inserting an element in the List 10.5 Deleting an element 10.6 Other Operation & Applications Reversing a Linked List 10.7 Concatenation of Two Lists 10.8 Representation of Polynomial 10.9 Circular Linked List & Operation 10.10 Doubly Linked List & Operation 10.11 Doubly Circular Linked List & Operation 10.12 Difference between an array and Linked list	14	7
11	**Stack** 11.1 Introduction 11.2 Definition 11.3 Operation on Stack 11.4 Static & Dynamic Implementation of a Stack 11.5 Application of Stack 11.6 Recursion 11.7 Infix, Prefix & Postfix expression	14	5
12	**Queue** 12.1 Introduction 12.2 Definition of a Queue 12.3 Operation on a Queue 12.4 Static & Dynamic Implementation of Queue 12.5 Types of Queue Circular Queue Priority Queue 12.6 DEQueue 12.7 Application of Queue 12.8 Reversing Stack using Queue	14	6

Reference Books
1. C: The Complete Reference: Herbert Schildt, Tata Mc-Graw Hill, 6th Edition
2. Magnifying C : PHI : Arpita Gopal
3. Let us C Solutions: Y.P. Kanetkar, BPB,10th Edition
4. Spirit Of "C": Moolish Cooper, JAICO.
5. Programming in C : S. Kochan, CBS.
6. C Programming Language: Kernighan & Ritchie, PHI,2nd Edition
7. Programming in C: R. Hutchison.
8. Graphics Under C: Y. Kanetkar, BPB.
9. Programming in ANSI C, E. Balgurusamy, Tata Mc-Graw Hill,5th Edition
10. Data Structures Using C and C++ : Langsam Y, PHI,2nd Ed.
11. Magnifying Data Structures : Arpita Gopal

12. C & Data Structures: Dreamtech publications
13. DS using C : Y.P. Kanetkar
14. www.cplusplus.com
15. www.cprogramming.com

Semester I				
Sr. No.	Subject Code	Subject Title	Internal	External
3	IT13	Software Engineering	30	70

Sr.No	Topic Details	% Weightage	No. of Sessions
1	**Overview of systems Analysis and design** 1.1 Basic System Development Life Cycle 1.2 Different approaches and models for System Development: Waterfall Prototyping Spiral (including WIN-WIN Spiral) RAD 1.3 Group Based Approach: JAD 1.4 Role & Skills of system Analyst	10	4
2	**Software Requirements Specification Techniques** 2.1 Requirements Anticipation 2.2 Requirements Investigation Fact finding methods 2.3 Requirements Specifications • Software requirement Specification (SRS) • Structure and contents of the requirements Specification • types of requirements - functional and non- functional • Quality criteria, • requirements definition, • IEEE standard SRS format, • Fundamental problems in defining requirements **Case studies on SRS should be covered**	20	8
3	**Information requirement Analysis** 3.1 Decision Analysis Tools Decision Tree, Decision Table, Structured English 3.2 Functional Decomposition Diagram 3.3 Process modeling with Data Flow Diagrams 3.4 Entity Relationship Diagram: Identify Entity &Relationships 3.5 Data dictionary **Case Studies on Decision analysis tools FDDs, DFDs should be covered**	23	9
4	**Designing of Input, Output and Program** 4.1 Design of input & Control Objectives of Input Design, Data Capture Guidelines	15	6

	Design of Source Document, Input Validations		
	4.2 Design of output Objectives of Output Design Types Of Output		
	4.3 User Interface design: Elements of good design, Design issues Features of modern GUI, Menus, Scroll bars, windows, buttons, icons, panels, error messages etc.		
	4.4 Design of program Specification		
	4.5 Code Design		
	Case studies should be covered on the above topic		
5	**Maintenance** 5.1 Types of Maintenance and maintenance cost 5.2 Introduction to legacy systems 5.3 Reverse Engineering 5.4 Role of documentation in maintenance and types of documentation	10	4
6	**CASE Tools** 6.1 Introduction to CASE tools, 6.2 Types of CASE tools Project Management Tools.Analysis tools,Design tools,Programming tools,Prototyping tools,Maintenance tools 6.3 Advantages and disadvantages of CASE Tools	10	4
7.	**Current trends in Software Engineering** 7.1 Software Engineering for projects & products. Introduction to Web Engineering and Agile Methodology- Scrum, Extreme Programming	12	5

Reference Books
1. Software Engineering by Pressman, TMH,7th Ed.
2. System Analysis and Design by Jalote,Narosa Pub, 3rd Ed
3. Software Engineering by Sommerville,Pearson,8th Ed
4. Software Engineering by W S Jawadekar,TMH.
5. System Analysis & Design methods by Whiten, Bentley,TMH,7th Ed.
6. System Analysis & Design by Elias Awad, Galgotia Pub,
7. Object Oriented Modeling & Design James Rumbaugh, PHI
8. Analysis & Design of Information System James Senn, TMH, 2nd Ed.
9. Analysis & Design of Information System V. Rajaraman,PHI,3rd Ed.
10. Software Engineering Concepts Richard Fairley,TMH.

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Semester I					

Sr. No.	Subject Code	Subject Title	Internal	External
4	IT14	Database Management System	30	70

Objective : The concepts related to database, database models, SQL and database operations are covered in this subject. This creates a strong foundation for application database design. Also the students are made aware of the connection between DBMS and the subjects like Data structures- tree, graphs ,Operating system – File Storage , Discrete Mathematics – Relational Operations, Software Engineering – DFD.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**Basic concepts** 1.1 Database and Need for DBMS 1.2 Characteristics of DBMS 1.3 Database Users 1.4 3-tier architecture of DBMS (its advantages over 2-tier) 1.5 Views of data-schemas and instances 1.6 Data Independence	5	2
2.	**Data Models** 2.1 **I**ntroduction to various data models – 2.2 Record based & Object based 2.3 Cardinality Ratio & Relationships 2.4 Representation of entities, attributes, relationship attributes, relationship set 2.5 Generalization, aggregation 2.6 Structure of relational Database and different types of keys 2.7 Structure of no-SQL database	13	5
3.	**Relational Model** 3.1 Codd's rules 3.2 Relational data model & relational algebra Relational model concept Relational model constraints Relational Algebra 3.3 Relational database language 3.4 Data definition in SQL, Views and 3.5 Queries in SQL, Specifying constraints and Indexes in SQL, Specifying constraints management systems Postgre SQL / MySQL	15	6
4	**Relational Database design** 4.1 Database Design – ER to Relational 4.2 Functional dependencies 4.3 Normalization Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF) 4.4 Loss less joins and dependencypreservingdecomposition	**17**	**7**
5	**Transaction And Concurrency control** 5.1 Concept of transaction, ACID properties 5.2 Serializibility	**18**	

	5.3 States of transaction,			**7**
	5.4 Concurrency control			
	5.5 Locking techniques			
	5.6 Time stamp based protocols			
	5.7 Granularity of data items			
	5.8 Deadlock			
6	**Crash Recovery and Backup**	15	6	
	6.1 Failure classifications			
	6.2 storage structure			
	6.3 Recovery & Atomicity			
	6.4 Log base recovery			
	6.5 Recovery with concurrent transactions			
	6.6 Failure with loss of Non-Volatile storage			
	6.7 Database backup & recovery from catastrophic failure			
	6.8 Remote Backup System			
7	**Security and privacy**	15	6	
	7.1 Database security issues			
	7.2 Discretionary access control based on grant & revoking privilege			
	7.3 Mandatory access control and role based access control for multilevel security			
	7.4 Encryption & public key infrastructures			
8	No- SQL Database-Introduction,Types of NOSQL,Need of NoSQL databases, Use Cases	**2**	1	

Reference Books

1. Introduction to database systems C.J.Date, Pearson.
2. Database system concept Korth, TMH,5th Ed.
3. Principles of Database Management James Martin, PHI.
4. Engineering MIS for Strategic Business Processes Arpita Gopal Excel Books
5. Fundamentals of Database Sysems Elmasri Navathe, Pearson,5th ed.
6. Object-oriented modeling and design Rumbaugh and Blaha, PHI.
7. Object-oriented analysis and design Grady Booch,Pearson,3rd Ed.
8. Database Management Systems Bipin Desai, Galgotia Pub.
9. Database system practical Approach to design, implementation & management Connoly & Begg, Pearson,4th Ed.
10. Database Management systems Ramakrishnan & Gehrke, McGraw-Hill,3rd Ed.
11.NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence Martin Fowler

Note:
1. PL/SQL to be covered as lab sessions
2. Postgre SQL/ MySQL Lab will be covered as Lab demo sessions.
3. Relational Calculus need not be covered in depth.
4. Case studies on ER diagram, Normalization and SQL should be covered

		Semester I		
Sr. No.	Subject Code	Subject Title	Internal	External
5	BM11	Principles and Practices of Management and Organizational Behavior	30	70

Objective: The basic management concepts and use of management principles in the organization will be introduced to student through this elaborative subject.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**Management** 1.1 The need, scope 1.2 Meaning and Definition 1.3 The process of Management 1.4 Managerial levels/Hierarchy 1.5 Managerial functions : Planning , Organizing , Staffing , Directing, Controlling 1.6 Managerial skills : Technical, Conceptual, Human Resource 1.7 Types of managers : Functional, Specialize, Generalize 1.8 Line and staff managers	10	4
2	**Evolution of Management Thought** 2.1 Historical perspective 2.2 Classical Theories : Taylor, Fayol 2.3 Behavioral : HR Approach Behavioral Science and Approach 2.4 Management Science Approach 2.5 System approach-with reference to management, organization and MIS 2.6 Contingency approach	10	4

3	**Managerial Decision Making**
	3.1 Introduction
	3.2 Decision making environment
	      Open Systems, Closed system
	      Decision making under certainty, under uncertainty, under risk
	3.3 Decision Types /models
	      Structured , Unstructured , Programmable &Non programmable Decisions
	      Classical Model
	      Administrative model
	3.4 Decision making tools
	      Autocratic, Participative, Consultative,
	3.5 Decision Making Tools
	3.6 Herbert Simon's Model
	3.7 Principle of Rationality / Bounded Rationality
		10	4

4	**Organization** 4.1 Introduction -definition 4.2 Need for Organization 4.3 Process of Organizing	10	4

	4.4 Organizational structure Functional organization Product Organization Territorial Organization		
5	**Organizational Behavior** 5.1 Definition / Concepts 5.2 Need /importance/ relevance 5.3 An overview	5	2
6	**Individual Behavior and Understanding Self** 6.1 Ego State 6.2 Transactional Analysis 6.2 Johari Window	10	4
7	**Group and Group Dynamics**	10	4
8	**Team Building**	10	4
9	**Leadership**	8	3
10	**Conflict Management**	10	4
11	**Motivation : Concept, Theory X, Y and Z**	7	3

Important Note: The topics in Units 3,4,5 and 6 should be covered with the help of at-least one exercise each. All topics in Organizational Behavior should be covered with the help of role plays, case studies, simulation, games etc.

Reference Books
1. Principles and Practices of Management Shejwalkar
2. Essential of management 7th edition Koontz H &Weitrich H TMH
3. Management Today Principles And Practices Burton & Thakur
4. Mgmt. Principles and Functions Ivancevich & Gibson, Donnelly
5. Organizational behavior Stepheb Robbins Pearson 13th edition
6. Organizational behavior Keith Davis
7. Organizational behavior Fred Luthans TMH 10th edition
8. Organizational behavior Dr.Ashwatthapa THI 7th edition

Semester I				
Sr. No.	Subject Code	Subject Title	Internal	External
6	BM12	Business Process Domains*	70	

Objectives:
1. To learn & understand the processes and practices in business and their applications
2. To introduce advance business applications like CRM and SCM.
3. To learn the financial aspect of business and management
4. To learn and analyze the financial statements of a business.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**Sales & Distribution** 1.1 Sales Budgeting – Market Segments / Customers / Products Sales Analysis (While explaining this application consider an organization manufacturing multiple products with sales outlets spread across the country)**Retail Marketing- New trends – Growth**	7.5	3
2	**Human Resource** 2.1 Employee Database 2.2 Recruitment – Techniques 2.3 Employee Appraisal – Performance, efficiency Leave Accounting and Payroll – Salary calculation and reporting, Income Tax calculation and reporting, Loan Accounting, PF and gratuity, Bonus, Ex-Gratia, Incentive, Super-annuation, Arrears Calculation **E-HR Software: Introduction**	7.5	3
3	**Banking and e-Commerce** Savings Bank Accounting - Real time, **ATM and E-Banking**	7.5	**3**
4	**Supply Chain Management(SCM) –** 4.1 Introduction, Concept, Scope and advantages 4.2 Customer Relationship management (CRM) – Introduction, Concept, Scope and advantages 4.3Forecasting : Demand forecasting and Planning	7.5	3
5	**Financial Accounting** 5.1 Double Entry Accounting system, Concepts and conventions inaccounting, Accounting process, Depreciation 5.2 Journalisation – Rules for Journalisation, posting in a Ledger, subsidiary books, preparation of Trial balance 5.3 Final Accounts – Preparation of Trading and profit and loss, Account and Balance sheet of a Proprietary Firm	30	12

6	**Cost Accounting**
	 6.1 Scope and Objectives of Cost Accounting – Classification and elements of cost, Advantages of Cost Accounting, Comparison between cost accounting and financial accounting.
	 6.2 Techniques of Cost Accounting
	     a) Marginal costing, Break-even chart, cost, volume profit analysis
	     b) Standard costing advantages, Variance analysis
	     c) Budgetary Control -Types of budgets and Flexible Budget Vs Fixed Budget, Preparation of Simple cash budget & Flexible budgets
	 6.3 Concept of Management Accounting – Objectives of Management Accounting, Comparison with Cost accounting
		40	16

Reference Books
1. Supply Chain Management - Strategy, Planning & Operation by Sunil Chopra, Peter Meindl, D. V. Kalra, Pearson Education.   2. Management Information Systems by Jaiswal and Mittal, Oxford University Press   3. e-Commerce A Manager's Guide to e-Business by Parag Diwan & Sunil Sharma   4. Personnel/ Human Resource Management by David DeCenzo, Stephen Robbins, Prentice Hall of India,2008, 3rd Edition   5. Human Resource Management by J. John Bernardin, Tata McGraw Hill Publishing, 4thEdition   6. Personnel Management C B Mammoria, Himalaya,29th Ed.   7. Business Applications Dr. Milind Oka, Everest Pub   8. Cost and Management accounting Satish Inamdar,Everest Pub,18th Ed.   9. Management Accounting Dr.Sanjay Patankar   10. Management Accounting Khan and Jain, TMH.

Semester I				
Sr. No.	Subject Code	Subject Title	Internal	External
7	IT12L	C & DS Lab *	50	

Objective :
To give hands on practice for writing C & DS programs and to inculcate good programming skills.

Assignments:

1. Find Area, Perimeter of Square & Rectangle.
2. Find max. Among 3 nos.
3. Check leap year
4. Factorial of Number
5. Calculate a^b
6. Prime Number.
7. Perfect Number.
8. Armstrong Number.
9. Floyd's Triangle
10. Fibonacci Series
11. Inter conversion of Decimal, Binary & Hexadecimal no.
12. LCM & GCD of numbers
13. Write a program to convert a number into words.
14. Insert & Delete an element at given location in array.
15. Transpose of matrices
16. Multiplication of matrices
17. Display upper & lower diagonal of matrices
18. Array of Structure e.g. student result, Employee pay slip , Phone bill
19. Function with no parameter & no return values
20. Function with parameter & return values
21. Function with parameter & no return values
22. Function with call by reference and return by reference.
23. Function with Default arguments
24. Write an inline function to obtain the largest of three numbers.
25. Recursion function e.g. sum of digit, reverse of digit
26. String manipulation function e.g. string copy, concatenation, compare, string length, reverse
27. Pointer Arithmetic
28. Write program to which gives all rotations of string.
29. Write program to deal with denominations of any amount.
30. Basic programs on DS
31. Write a program to store the personal information of a person and display it in formatted form.
Data Structure:
1.Addition and Multiplication of Two Polynomials.
2. Addition and Transpose of Sparse Matrices.
3. Singly Linked List: Create, Display, Insertion, Deletion, Search, Reverse
4. Singly Circular Linked List: Create, Display, Insertion, Deletion, Search,
5. Doubly Linked List: Create, Display, Insertion, Deletion, Search, Reverse
6. Stack Implementation
7. Stack Application: Inter conversion of Infix, Prefix & Postfix
8. Stack Application: Palindrome & Matching Parenthesis.
9. Queue Implementation
10. Queue Application: Job Scheduling.

Semester I				
Sr. No.	Subject Code	Subject Title	Internal	External
8	IT14L	DBMS Lab *	50	

Objective :

To develop database handling, data manipulation and data processing skills through SQL & PL/SQL, which will help students to develop data centric computer applications.

Topics

1. Overview of RDBMS, Introduction to Postgre SQL
2. Start, stop and restart PostgreSQL database
3. Introduction of SQL- DDL, DML, DTL, Basic Data Types
4. Create Database, Select Database, Drop Database
5. Create Table, Drop Table, Insert Query, Select Query
6. Operators, Expressions, Where Clause, AND & OR Clauses
7. Update Query, Delete Query, Like Clause, Limit Clause
8. Order By, Group By, With Clause, Having Clause, Distinct Keyword
9. Constraints, Joins, Unions Clause, NULL Values, Alias Syntax
10. Alter Command, Truncate Table, Transactions Locks, Sub Queries, Autoincrement,Privileges
11. Functions: Date & Time,String Functions, Aggregate Functions
12. Postgre SQL Interface: C/C++ / Java/PHP/Python
13. Synonym – introduction, Create, synonym as alias for table & view, drop
14. Sequence- Introduction, alter sequence, drop
15. View- Introduction, types,alter , drop
16. Index - Introduction,types, alter, drop
17. Primary introduction to DBA-User create, alter User,Grant,Revoke
18. Report writer using SQL Title, Btitle, skip, pause, column, SQL, Break on, computer sum
19. PL/SQL - Introduction of PL/SQL,Advantages of PL/SQL,Support of SQL, Executing PL/SQL
20. PL/SQL character set & Data Types
21. PL/SQL blocks Attribute % type, %rowtype, operators
22. Control structure Condition – if Interactive- loop, for, while Sequential – goto
23. Procedures- Definition, creating, Parameter
24. Function-Definition, creating, Parameter
25. Cursor- types
26. Database Triggers- Definition, syntax, parts of triggers ,Types of triggers, enabling &disabling triggers

Reference Books:

1. PostgreSQL by Korry Douglas, Susan Douglas ISBN #0735712573, New Riders
2. PostgreSQL Essential Reference by Barry Stinson ISBN #0735711216, New Riders
3. Beginning Databases with PostgreSQL by Richard Stones, Neil Matthew ISBN #1861005156, Wrox Press Inc
4. Practical PostgreSQL John C. Worsley, Joshua D. Drake ISBN #1565928466, O'Reilly

		Semester I		
Sr. No.	Subject Code	Subject Title	Internal	External
9	SS11	Soft Skill – Word Power*	30	

Objective :

To improve the vocabulary of English and comfort ability with business English. Use of language lab is also encouraged and lot of hearing practice, reading and understanding exposure should be given to the students.Interested students may appear for Cambridge English exam after
 completion of 1st year.

Reference Books:

1. Essential English Grammar – Raymond Murphy- Cambridge University Press
2. Cambridge IELTS – Cambridge University Press
3. Murphy's English Grammar - Raymond Murphy- Cambridge University Press
4. Speaking English Effectively - Krishna Mohan/N.P.Singh-Macmillan
5. English Conversation Practice - Grant Taylor-The McGraw-Hill Companies

SEMESTER II				

Semester II				
Sr. No.	Subject Code	Subject Title	Internal	External
1	IT21	Essentials of Operating system	30	70

Objective : To Learn and understand the fundamentals of Operating systems

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**Introduction** 1.1 OS Definition, features and functionalities 1.2 Logical View , User View, 1.3 Concept of System Calls & System Programs (Only concept) 1.4 Concept of OS structure 1.5 Concept of Virtual Machine	10	4
2	**Process Management** 2.1 Process Concept 2.2 Process Control Block 2.3 Process operations : Create, Kill, suspend, resume, wakeup, 2.4 Interprocess Communication, IPC types 2.5 IPC in Client-Server, RTOS	**15**	**6**
3	**CPU Scheduling** 3.1 Scheduling Concept 3.2 Scheduling Criteria 3.3 Scheduling algorithms 3.4 Numerical exercise based on algorithms 3.5 Scheduling Evaluation 3.6 Simulation Concept	**15**	**6**
4	**Process Synchronization &Deadlock** 4.1 Synchronization concept 4.2 SynchronizationRequirement 4.3 Critical Section Problem & Solutions 4.4 Monitors 4.5 Deadlock concepts 4.6 Deadlock prevention & avoidance with single instance and multiple instances of resources 4.7 Deadlock Detection with single instance and multiple instances of resources 4.8 Numerical exercise based on Deadlock 4.9 Deadlock Recovery	**20**	**8**
5	**Memory Management** 5.1 Concept 5.2 Memory Management Techniques 5.3 Contiguous & Non Contiguous allocation 5.4 Logical & Physical Memory 5.5 Conversion of Logical to Physical address 5.6 MFT and MVT with search algorithms 5.7 Numerical exercise based on search algorithms 5.8 Paging, Segmentation 5.9 Numerical exercise based on logical to physical address	**20**	**8**

	conversion using Paging and segmentation.
	5.10 Segment with paging
	5.11 Virtual Memory Concept
	5.12 Demand paging
	      Page Replacement algorithm with numerical exercises
	      Allocation of Frames
	5.13 Thrashing		

6	**File management** 6.1 File Structure 6.2 Protection 6.3 FILE system Implementation 6.4 Directory structure 6.5 Free Space Management 6.6 Allocation Methods 6.7 Efficiency & Performance 6.8 Recovery	10	4
7	**Disk Management** 7.1 Disk Structure 7.2 Disk Scheduling algorithm 7.3 Numerical exercise based on Disk algorithms 7.4 Disk management 7.5 Swap Space concept and Management 7.6 RAID structure 7.7 Disk performance issues	10	4

Reference Books
1. Operating System : Achyut Godbole,TMH,2nd Ed.
2. Operating System : Galvin,Wiley,8th Ed.
3. System Programming & OS : D.M. Dhamdhere, TMH,2nd Ed.
4. Red Hat Bible Core Fedora Linux : Christopher Negus (Wiley Pub.)
5. Operating System : Andrew Tanenbaum, PHI,3rd Ed.

Semester II				
Sr. No.	Subject Code	Subject Title	Internal	External
2	IT22	Web Technologies	30	70

Objectives:

This course enables students to understand web page site planning, management andmaintenance. The course explains the concepts of developing advanced HTML pages with the help of frames, scripting languages, and evolving technologies like DHTML.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**HTML** 1.1. Introduction To HTML, WWW, W3C, Common HTML 1.2. Tags and attributes, Ordered & Unordered Lists, 1.3. Inserting image 1.4. Client server image mapping 1.5. Text and image links 1.6. Tables 1.7. Frames 1.8. Forms 1.9. Introduction with text box, text area, buttons, List box, radio, checkbox etc.	25	10
2	**CSS** 2.1 Introduction to Style Sheet 2.2 Types of style Sheets 2.3 Inline, External, Embedded CSS. 2.4 CSS Border, margin, Positioning, color, text, link, background, list, table, padding, image, display properties 2.5 Use of Id & classes in CSS 2.6 use of <div>&<span> 2.7 Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns	20	5
3	**Javascript** 3.1 Concept of script, Types of Scripts,Introduction to javascript 3.2 Variables, identifiers constants in javascript and examples of each. 3.3 Operators in javascripts, various types of javascript operator 3.4 Examples on javascript operators, 3.5 Control and looping structure, examples on control and looping structures(if, if...else, for, while, do while, switch, etc....) 3.6 Concept of array, how to use it in javascript , types of an array, examples 3.7 Methods of an array , examples on it. 3.8 Event handling in javascript with examples 3.9 Math and date object and examples on it. 3.10 String object and examples on it, and some predefined functions	30	15

	3.11 DOM concept in javascript, DOM objects 3.12 Window navigator, History object and its methods, 3.13 Location object with methods and examples 3.14 Validations in javascript , examples on it..		

4	**ASP**
	4.1 Introduction to ASP
	4.2 How to install IIS
	4.3 ASP syntax ,variables,procedures
	4.4 ASP Forms
	4.5 ASP Session and Cookies
	4.6 ASP Global.asa
	4.7 ASP Objects- Request,Response,Application,Server.
	4.8 ASP Database related operations –Insert
	    ,Retrive,Update,Delete.
	    Programs on Database related operations
		25	10

Reference Books
1.   Complete reference HTML, TMH, 2.   JavaScript Bible, Wiley Pub. 3.   HTML, DHTML, JavaScript, Perl & CGI Ivan Bayross, BPB Pub 4.   VB Script Programmer' s reference by Wrox Press 5.   Programming the World Wide Web by Robert W. Sebesta 6.   Web enabled Commercial Application Development using HTML, DHTML 7.   VBScript Programmers reference wrox Press 8.   VBScript in Nutshell **Reference Sites:** 1.   http://www.w3schools.com 2.   www.devguru.com

Semester II				
Sr. No.	Subject Code	Subject Title	Internal	External
3.	IT23	Core Java	30	70

Objective:
To enable the students to understand the core principles of the Java Language and use visual tools to produce well designed, effective applications and applets

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**Fundamentals of OOP** What is OOP Difference between Procedural and Object oriented programming Basic OOP concept - Object, classes, abstraction, encapsulation, inheritance, polymorphism	5	2
2	**Introduction to JAVA** History of Java Features of Java Difference between C++ & JAVA JDK Environment Java Virtual Machine Java Runtime environment	2.5	1
3	**Programming Concepts of Basic Java** Identifiers and Keywords Data Types in Java Java coding Conventions Expressions in Java Control structures, decision making statements Arrays and its methods Garbage collection & finalize() method	5	2
4	**Java classes** Define class with instance variables and methods Object creation of class Accessing member of class Argument passing Constructors Method overloading static data, static methods, static blocks this keyword Nested & Inner classes Wrapper Classes String (String Arrays, String Methods, StringBuffer)	10	4
5	**Inheritance** Super class & subclass Abstract method and classes Method overriding	10	4

	final keyword super keyword Down casting and up casting Dynamic method dispatch		
6	**Packages and Interfaces** Importing classes User defined packages Modifiers & Access control (Default, public, private, protected, private protected) Implementing interfaces User defined interfaces Adapter classes	10	4
7	**Exception handling** Types of Exceptions try, catch, finally, throw, throws keywords Creating your own exception Nested try blocks Multiple catch statements User defined exceptions	7.5	3
8	**Java Input Output** Java IO package File Class Byte/Character Stream Buffered reader / writer File reader / writer Print writer File Sequential / Random Serialization and de serialization	7.5	3
9	**Multithreading** Multithreading Concept Thread Life Cycle Creating multithreading Application Thread Priorities Thread synchronization Inter thread communication	10	4

10	**Abstract Window Toolkit**
	Components and Graphics
	Containers, Frames and Panels
	Layout Managers
	    a. BorderLayout
	    b. FlowLayout
	    c. GridLayout
	    d. CardLayout
	AWT all Components
	Event Delegation Model
	    e. Event Source and Handlers
	    f. Event Categories, Listeners, adapters
		10	4

	Anonymous Classes		
11	**Applets** Applet life cycle Creating applet Displaying it using Web Browser with appletwiewer.exe The HTML APPLET Tag with all attributes. Passing Parameters to applet Event handling in applet Advantages and Disadvantages of Applet Vs Applications	5	2
12	**Swing** Features of swing Model view Controller design pattern Swing components JButton, JRadioButton,JtextArea,JComboBox,JTable,JProgressBar, JSlider ,JDialog	5	2

13	**Java Collection Framework**
	Collections Overview
	The Collection Interfaces
	    a. Collection Interface, List Interface, Set Interface,
	    b. SortedSet Interface
	    c. The Collection Classes
	    d. ArrayList Class, LinkedList Class, HashSet Class, TreeSet Class
	    e. Accessing a Collection via an Iterator
	The Map Interfaces
	    f. Map Interface, SortedMap Interface
	    g. The Map Classes
	    h. HashMap, TreeMap
	The Legacy Interfaces
	    i. Enumeration Interface
	    j. The Legacy Classes
	Vector , Stack Hashtable
		12.5	5

Reference Books
1. Just Java by Peter Van der Liden
2. OOP with Java An ultimate Tutorial by Jaffry A Borror,
3. Java 6 Programming Black Book By Kogent Solution Inc, dreamTech Pub
4. Core Java 2 Volume - I Cay S Horstmann, Fary Cornell, Sun Microsystems Press
5. Core Java 2 Volume - II Cay S Horstmann, Fary Cornell, Sun Microsystems Press
6. Programming with Java, A Primer E.Balguruswami, McGraw-Hill, 4th Ed.
7. Object oriented programming with java, Essentials and applications ,Mc Graw Hill publications, RajkumarBuyya, S ThamaraiSelvi, Xingchen Chu
8. A programmer's Guide to java SCJP certification, Pearson,Khalid A. Mughal, Rolf W. Rasmussen.

Semester II				
Sr. No.	Subject Code	Subject Title	Internal	External
4.	IT24	Essentials of Networking	30	70

Objective:
To learn and understand fundamentals of computer network , network architectures, protocols and applications

Sr. No	Topic details	*% Weightage*	No. of Sessions

1	**Introduction:**
	 What is a Computer communication, communication system, Signal and Data,
	 Channel Characteristics, Transmission Modes, Synchronous and asynchronous transmission.
	 Transmission Media:
	   a)Guided Media – Twisted Pair, Coaxial and Fiber-optic cables,
	   b)Unguided Media: Radio, VHF, Micro Waves and Satellite
	 Multichannel Data Communication: Circuits, channels and multichanneling
	 Multiplexing: FDM, TDM, CDM and WDM
		12	5

2	**Common Network Architecture** Connection oriented N/Ws vs Connectionless N/Ws Peer to peer networks X.25 networks Ethernet (Standard and Fast): frame format and specifications Wireless LANs - 802.11(Architecture, issues, features etc.), 802.11x	13	5
3	**The OSI Reference Model** Protocol Layering ISO/OSI reference Model TCP/IP Model OSI vs.TCP/IP	13	5
4	**Local Area Networks** Components & Technology, Access Technique, Transmission Protocol & Media	7	3
5	**Broad Band Networks** Integrated Service Digital Networks (ISDN), Broad Band ISDN, ATM and ATM Traffic Management Very Small Aperture Terminal (VSAT)	10	4
6	**IP Addressing & Routing** IP addresses – Network part and Host Part Network Masks, Network addresses and Broadcast addresses, Address Classes, Loop back address, IP routing concepts, Routing Tables, Stream & Packets	25	10

	Sliding Windows Role and Features of IP, TCP TCP Connections types and working. IPV6: The next generation Protocol		
7	**Application Layer**: Domain Name System (DNS) and DNS servers, Electronic Mail: Architecture and services, Message Formats, MIME, message transfer, SMTP, Mail Gateways, Relays, Configuring Mail Servers, File Transfer Protocol, General Model, commands World Wide Web: Introduction, Architectural overview, static and dynamic web pages, WWW pages and Browsing, HTTP	20	8

Reference Books

1.Computer Networks Andrew S. Tanenbaum, Pearson,5th Ed
2. Data Communications and Networking Behrouz A. Forouzan , TMH,4th Ed.
3. Cryptography and Network Security AtulKahate , TMH, 2nd Ed.
4. Network Essential Notes GSW MCSE Study Notes
5. Internetworking Technology Handbook CISCO System
6. Computer Networks and Internets with
7. Internet Applications Douglas E. Comer
8. Cryptography and Network Security William Stalling

	SEMESTER II			

		Semester II		
Sr. No.	Subject Code	Subject Title	Internal	External
5	MT21	Discrete Mathematics	30	70

Objective: This is the first mathematics subject which revises the knowledgeacquired previously by the student. Logic, Relations and Functions, AlgebraicFunctions and Graph Theory will be introduced in this course.

Sr. No	Topic Details	% Weightage	No. of Sessions
1	**MATHEMATICAL LOGIC** Propositions (Statements), Logical connectivity's, $\rceil, \wedge, \vee, \rightarrow, \leftrightarrow$, Compound statements form, truth tables, tautology, implications and equivalence of statements forms logical identities. Normal forms: disjunctive normal form and, simplification. Conjunctive normal form, logical implications, valid arguments, methods of proof. Theory of inference of statement calculus, predicate calculus, qualifiers free and bound variables, theory of inference of predicate calculus.	30	13
2	**RELATIONS AND FUNCTIONS** Relation defined as ordered n-tuple, Unary, binary, ternary, n-ary, Restrict to binary relations, Complement of a relation, converseRelation, compositions, matrix representation and its properties, Graphical representation of relation –Digraphs Properties of binary relation –Reflexive,irreflexive, symmetric, Asymmetric, transitive, Equivalence, equivalence classes, partitions, covering, compatible relation, maximal compatibility block, transitive closure– Warshall's algorithm. Partial ordering relation – Hasse diagram,minimal elements, upper bound , lower bound, definitions Functions – definitions, Partial function, hashing functions,characteristic functions, floor functions, ceilingfunctions, surjective, injunctive and bijective functions, Inverse functions, Non-denumerable sets.	20	7
3	**ALGEBRAIC STRUCTURES** Operations on sets – Unary, binary, ternary. Definitions of algebraic systems(Restrict to binary operations). Properties – closure, idempotent, communicative, associative, commutative,identity, inverse. Semigroup, sub-semigroup, Monoid, sub-monoid group, abelian group,permutation group, multiplicative abeliangroup, cyclic group	20	7

	Subgroups: Cosets, right cosets, left cosets,normal subgroups, quotient groups,isomorphism, homomorphism. Group codes: Weight and Hamming distance,minimum distance of code , generation ofcodes using parity checks – even parity, oddparity , parity check matrix – Hamming code,for detection and correction errors , formationof encoding function, decoding, Application of residue –arithmetic tocomputers group codes.		
4	**GRAPH THEORY** Basic terminology, simple and weightedgraph, adjacency and incidence, hand-shakinglemma, underlying graph of a digraph, complete graph, regular graph, bipartitegraph, complete bipartite, Isomorphism, complement of graph,connected graphs, paths-simple, elementary, circuit – simple, elementary Edge connectivity, vertex connectivity, Eulerian path and Eulerian circuit, planargraph – regions Euler's formula Trees : Definition – leaf, root, branch node,internal node, Rooted and binary trees, regular m-ary tree	30	13

Reference Books

17. Discrete Mathematical Structures for Computer S Science by Kolman B and Bushy R
18. Discrete Mathematical Structures with applications to Computer Science by Tremblay and Manohar
19. Discrete Mathematics by C L Liu
20. Discrete Mathematics by Rosen

SEMESTER II				
Sr. No.	Subject Code	Subject Title	Internal	External
6	BM 21	Essentials of Marketing	70	

Objectives:
1. To make students understand the essentiality of Marketing in business Environment.
2. To comprehend the functionalities of Marketing and IT enabled practices for organizations

Sr. No	Subject Topic details	% Weightage	No. of Sessions
1	**Marketing : Introduction** 1.1 Definitions, Scope , Core concepts of marketing such as Need, Want, Demand, Customer Value, Exchange, Customer & Consumer, Customer Satisfaction, Customer Delight, Customer Loyalty, Marketing v/s Market 1.2 **Markets:** Definition of Market, Competition, Key customer markets, Marketplaces, Market spaces, Metamarkets 1.3 **Company Orientation towards Market Place:** Product, Production, Sales, Marketing, Societal, Transactional, Relational, Holistic Marketing Orientation. Selling versus Marketing, e- marketing	15	6
2	**Marketing Mix:** 2.1 Concept of Marketing Mix 2.2 7Ps of Marketing (People, Processes & Physical Evidence)	15	6
3	**Consumer Behaviour** 3.1Definition& importance of consumer behavior, 3.2 Comparison between Organizational Buying behavior and consumer buying behaviour, 3.3 Buying roles, 3.4 Steps buyer decision process	20	8
4	**Segmenting and Targeting Online Customers:** 4.1 Business – Government and Customer Markets, 4.2 Geographic segments for E-Marketing, Demographic segments, Psychographic segments, Behavior segments, Targeting online customers. **4.3 Differentiation and Positioning Strategies** Product – Service – Personnel – Channel and Image differentiation. 4.4 Differentiation Strategies – site atmospherics, making the intangible tangible, building trust, efficient and timely order processing, pricing, customer experience.	20	8
5	**E-Marketing:** **5.1 Product Mix** Product, Creating Customer Value online, Product benefits, Enhanced product development, **5.2 Price:** Buyers & sellers perspectives, Pricing strategies, Distribution System	20	8
6	Cases/ Marketing Plans/ Mix, e- marketing	10	4

Note: Formulation of Marketing Mix and e-marketing plans should be prepared in a group of 5 students. Presentation of those plans to be carried out in the class hours so as to create interest between students.

Reference Books
1. Marketing Management: A South Asian Perspective, 14th Edition(English),Philip Kotler, K. Keller, Abraham Koshy and Mithileshwar Jha
2. Marketing Management by S A Sherlekar
3. E- Marketing by Judy Strauss, Adel Ansary, Raymond Frost, Prentice Hall
4. Digital Marketing for Dummies by Carter-Brooks-Catalano-Smith
5. Guide to E-Marketing by Prasad Gadkari
6. e-Service-New Directions in Theory & Practice by Roland T. Rust and P.K. Kannan
http://www.marketingteacher.com
http://www.emarketingstrategiesbook.com/

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
7	IT22L	Mini Project using Web Technology *	50	

Objective: Student should able to develop a small dynamicweb application.

A small dynamic web application will be developed by the students using knowledge of HTML, DHTML, JavaScript and ASP.

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
8	IT23L	Core Java Lab *	50	

Objective :
This lab work will provide hands on practice to student to enhance their Java Programming Skills. Assignments on Java concepts such as Interfaces, Packages, Exception Handling, Applet, multithreading, Abstract Windows Toolkit, Java Input Output & Java collection   can be included.

Semester II				
Sr. No.	**Subject Code**	**Subject Title**	**Internal**	**External**
9	SS21	Soft Skill - Oral Communication*	30	

Objectives:
To enhance the verbal communication of students.To focus on conversation with colleagues, Dialogues with Higher authorities.To focus on Formal and Informal Conversation, etiquettes

Internal [30] Marks Breakup	
Unit Test Marks	5
Prelim Marks	5
Assignment	5
Presentations/Case-Study/Group Activity/Oral	10
Attendance	5
Total Marks	**30**

Practical[50] Marks Breakup	
Practical Hands on	40
Viva-voce	5
Assignments	5
Total Marks	**50**