VARDHAMAN COLLEGE OF ENGINEERING
(AUTONOMOUS)
(Permanently Affiliated to JNTUH, Approved by AICTE, New Delhi and Accredited by NBA)
Shamshabad – 501 218, Hyderabad

MASTER OF TECHNOLOGY
COMPUTER SCIENCE AND ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI FOR
M.TECH - COMPUTER SCIENCE AND ENGINEERING
UNDER AUTONOMOUS STATUS
FOR THE BATCHES ADMITTED FROM THE ACADEMIC YEAR 2011 - 12

Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already undergoing the program) as may be decided by the Academic Council.

PRELIMINARY DEFINITIONS AND NOMENCLATURES

➢ "Autonomous Institute / College" means an institute / college designated as autonomous institute / college by the Jawaharlal Nehru Technological University, Hyderabad (JNTUH), as per the JNTUH Autonomous College Statutes, 2011.

➢ "Academic Autonomy" means freedom to a College in all aspects of conducting its academic programs, granted by the University for promoting excellence.

➢ "Commission" means University Grants Commission.

➢ "AICTE" means All India Council for Technical Education.

➢ "University" the Jawaharlal Nehru Technological University, Hyderabad.

➢ "College" means Vardhaman College of Engineering, Hyderabad unless indicated otherwise by the context.

➢ "Program" means:
        Bachelor of Technology (B.Tech) degree program
        UG Degree Program: B.Tech
        PG degree Program: M.Tech

➢ "Branch" means specialization in a program like M.Tech degree program in Power Electronics and Electrical Drives.

➢ "Course" or "Subject" means a theory or practical subject, identified by its course – number and course-title, which is normally studied in a semester. For example, ABS11T01: Mathematics - I, ACS11T02: Data Structures through C, etc.

➢ T – Tutorial, P – Practical, D – Drawing, L - Theory, C - Credits

FOREWORD

The autonomy is conferred on Vardhaman College of Engineering by J N T University, Hyderabad based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like UGC and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system** and **monitoring mechanism**, independent of the affiliating University but under its observance.

Vardhaman College of Engineering is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTU Hyderabad to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the college to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

VARDHAMAN COLLEGE OF ENGINEERING
(Autonomous)
(Permanent Affiliation with JNTUH, Approved by AICTE, New Delhi and Accredited by NBA)

ACADEMIC REGULATIONS

M.Tech. Regular Two Year Post-Graduate Programme
(For the batches admitted from the academic year 2011–12)

For pursuing Two year degree program of study in Master of Technology (M.Tech.) offered by Vardhaman College of Engineering under Autonomous status and herein after referred to as VCE:

1.   APPLICABILITY

All the rules specified herein, approved by the Academic Council, will be in force and applicable to students admitted from the academic year 2011-2012 onwards. Any reference to "College" in these rules and regulations stands for Vardhaman College of Engineering.

2.   EXTENT

All the rules and regulations, specified herein after shall be read as a whole for the purpose of interpretation and as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies Principal, Vardhaman College of Engineering shall be the Chairman, Academic Council.

3.   PROGRAMS OFFERED

Vardhaman College of Engineering, an autonomous college affiliated to JNTUH, offers the following M.Tech programmes of study leading to the award of M.Tech degree under the autonomous scheme.

S. No	M.Tech Courses	Intake
1	Computer Science and Engineering	36
2	Software Engineering	18
3	Digital Electronics and Communication Systems	36
4	Wireless and Mobile Communications	18
5	Power Electronics and Electrical Drives	18

4.   ADMISSION

Admission into first year of Two Year M.Tech Program shall be made subject to the eligibility, qualifications and specialization as per the guidelines prescribed by the APSCHE and AICTE from time to time.

5. DURATION OF THE PROGRAMS

5.1 Normal Duration

M.Tech degree program extends over a period of two academic years leading to the Degree of Master of Technology (M.Tech) of the Jawaharlal Nehru Technology University, Hyderabad.

5.2 Maximum Duration

5.2.1 The maximum period within which a student must complete a full-time academic program is 4 years for M.Tech. If a student fails to complete the academic program within the maximum duration as specified above, he / she will be required to withdraw from the program.

5.2.3 The period is reckoned from the academic year in which the student is admitted first time into the degree programme.

6. SEMESTER STRUCTURE

The College shall follow semester pattern. An academic year shall consist of a first semester and a second semester and the summer term. Each semester shall be of 23 weeks duration and this period includes time for course work, examination preparation, and conduct of examinations. Each semester shall have a minimum of 90 working days. The academic calendar is shown in Table 1 is declared at the start of the semester. The duration for each semester shall be a minimum of 17 weeks of instruction.

Table 1: Academic Calendar

FIRST SEMESTER (23 weeks)	I Spell Instruction Period	: 9 weeks	19 weeks
	I Mid Examinations	: 1 week	
	II Spell Instruction Period	: 8 weeks	
	II Mid Examinations	: 1 Week	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Semester Break			2 weeks
SECOND SEMESTER (23 weeks)	I Spell Instruction Period	: 9 weeks	19 weeks
	I Mid Examinations	: 1 week	
	II Spell Instruction Period	: 8 weeks	
	II Mid Examinations	: 1 Week	
	Preparation & Practical Examinations		2 weeks
	External Examinations		2 weeks
Summer Vacation			4 weeks
THIRD SEMESTER	Project Work Phase – I		18 Weeks
FOURTH SEMESTER	Project Work Phase – II		18 Weeks

7. CREDIT BASED SYSTEM

All the academic programs under autonomy are based on credit system. Credits are assigned based on the following norms:

7.1. The duration of each semester will normally be 23 weeks with 5 days a week. A working day shall have 6 periods each of 60 minutes duration.

- 1 credit per lecture period per week
- 2 credits for three (or more) period hours of practicals
- 2 credits for technical seminar
- 4 credits for comprehensive viva examination
- 18 credits for project work phase – I
- 22 credits for project work phase – II

7.2. The two year curriculum of any M.Tech programme of study shall have total of 88 credits. The exact requirements of credits for each course will be as recommended by the Board of Studies concerned and approved by the Academic Council.

7.3. For courses like technical seminar / comprehensive viva / Project Work Phases – I and II, where formal contact hours are not specified, credits are assigned based on the complexity of the work to be carried out.

8. METHOD OF EVALUATION

The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks each for theory and 100 marks for practical, on the basis of Internal Evaluation and End Semester Examination.

8.1 Theory

For all lecture based theory courses, the evaluation shall be for 40 marks through internal evaluation and 60 marks through external end semester examination of three hours duration.

8.1.1. Internal evaluation

For theory subjects, during the semester there shall be 2 midterm examinations. Each midterm examination consists of subjective test. The subjective test is for 40 marks, with duration of 2 hours. The Mid-Term Examination question paper shall be set with **six** questions out of which **four** are to be answered. All questions carry equal marks.

First midterm examination shall be conducted for I – IV units of syllabus and second midterm examination shall be conducted for the remaining portion.

The internal marks shall be computed as the average of the two internal evaluations, of two subjective tests.

8.1.2. External Evaluation

The question paper shall be set externally and valued both internally and externally. The external end semester examination question paper in theory subjects will be for a maximum of 60 marks to be answered in three hours duration. For End-Semester examination, the candidate has to answer any five out of eight questions. Each question carries 12 marks. Each theory course shall consist of eight units of syllabus.

8.2. Practicals

Practicals shall be evaluated for 100 marks, out of which 60 marks are for external examination and 40 marks are for internal evaluation. The 40 internal marks are distributed as 25 marks for day-to-day work and 15 marks for internal examination. The external end - examination shall be conducted by the teacher concerned and an external examiner from outside the college.

8.3. Technical Seminar

The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar

topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar supervisor and a senior faculty of the department. The two components of the seminar are distributed between two halves of the semester and are evaluated for 50 marks each. The average of the two components shall be taken as the final score. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

8.4. Comprehensive Viva

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his/her nominee, two senior faculty of the respective department and an external examiner from outside the college. This is aimed at assessing the student's understanding of various subjects studied during the entire program. The comprehensive viva shall be evaluated for 50 marks at the end of III semester. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

8.5. Project Work

The project work shall be evaluated for 200 marks out of which 50 marks for phase – I internal evaluation, 50 marks for phase – II internal evaluation and 100 marks for end semester evaluation. A minimum of 50% of marks on the aggregate in the internal evaluation and external end-evaluation taken together shall be obtained to earn the corresponding credits.

Every candidate is required to submit dissertation after taking up a topic approved by the Departmental Committee. The project work shall be spread over in III semester and in IV semester. The project work shall be somewhat innovative in nature, exploring the research bent of mind of the student.

The Departmental Committee (DC) consists of HOD, Supervisor and two senior experts in the department. The committee monitors the progress of Project Work. The DC is constituted by the Principal on the recommendations of the department Head.

Student shall register for the Project work with the approval of Departmental Committee in the III Semester and continue the work in the IV Semester too. The Departmental Committee (DC) shall monitor the progress of the project work. In III Semester, Phase – I of the Project Work is to be completed. A Student has to identify the topic of work, collect relevant Literature, preliminary data, implementation tools / methodologies etc., and perform a critical study and analysis of the problem identified. He shall submit status report in two different phases in addition to oral presentation before the Departmental Committee for evaluation and award of 50 internal marks at the end of Phase – I.

A candidate shall continue the Project Work in IV Semester (Phase – II) and submit a Project report at the end of Phase – II after approval of the Departmental Committee. During Phase – II, the student shall submit status report in two different phases, in addition to oral presentation before the DC. The DC shall evaluate the project for 50 internal marks based on the progress, presentations and quality of work.

A candidate shall be allowed to submit the dissertation only after passing all the courses of I and II semesters with the approval of Departmental Committee not earlier than **40 weeks** from the date of registration of the project work and then take viva-voce examination. The viva-voce examination may be conducted once in three months for all the eligible candidates.

Three copies of the dissertation certified in the prescribed form by the supervisor and HOD shall be presented to the Department and one copy is to be submitted to the Controller of Examinations, VCE and one copy to be sent to the examiner.

The department shall submit a panel of three experts for a maximum of 5 students at a time. However, the examiners for conducting viva-voce examination shall be nominated by the Controller of Examinations, VCE. If the report of the examiner is favorable, viva-voce examination shall be conducted by a board consisting of the Supervisor, Head of the Department and the examiner who adjudicated the dissertation. The board shall jointly evaluate the project work for 100 marks. The

candidates who fail in viva-voce examinations shall have to re-appear the viva-voce examination after three months. If he fails again in the second viva-voce examination, the candidate has to re-register for the Project Work.

If a candidate desires to change the topic of the project already chosen during Phase – I, he has to re-register for Project work with the approval of the DC and repeat Phases – I and II. Marks already earned in Phase – I stand cancelled.

9. ATTENDANCE REQUIREMENTS TO APPEAR FOR THE SEMESTER-END EXAMINATION

9.1. A student shall be eligible to appear for semester-end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

9.2. Condonation of shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

9.3. Shortage of attendance below 65% in aggregate shall in no case be condoned.

9.4. Students whose shortage of attendance is not condoned in any semester are not eligible to take their semester-end examination of that class and their registration shall stand cancelled.

9.5. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the current semester. The student may seek readmission for the semester when offered next. He will not be allowed to register for the subjects of the semester while he is in detention. A student detained due to shortage of attendance, will have to repeat that semester when offered next.

9.6. A stipulated fee shall be payable towards condonation of shortage of attendance to the College.

9.7. Attendance may also be condoned as per the recommendations of academic council for those who participate in prestigious sports, co-curricular and extra-curricular activities provided as per the Govt. of AP norms in vogue.

10. ACADEMIC REQUIREMENTS FOR PROMOTION / COMPLETION OF REGULAR M.TECH PROGRAMME OF STUDY

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion / completion of regular M.Tech programme of study.

i. A student shall be deemed to have satisfied the minimum academic requirements for each theory, and practical, if he secures not less than 40% of marks in the semester-end examination and a minimum of 50% of marks in the sum of the internal evaluation and semester - end examination taken together.

ii. In case of technical seminar and comprehensive viva a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he/she secures not less than 50% of marks.

iii. In case of project work, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted if he/she secures not less than 50% of marks on the aggregate in the internal evaluation and external end-evaluation taken together.

iv. A student shall register for all the 88 credits and earn all the 88 credits. Marks obtained in all the 88 credits shall be considered for the award of the class based on aggregate of marks.

v. A student who fails to earn 88 credits as indicated in the course structure within **FOUR** academic years from the year of their admission shall forfeit their seat in M.Tech programme and their admission stands cancelled.

viii. Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. However, all such readmitted students shall earn all the credits of subjects they have pursued for completion of the course.

11. EVALUATION

Following procedure governs the evaluation.

11.1. Marks for components evaluated internally by the faculty should be submitted to the Controller of Examinations one week before the commencement of the semester-end examinations. The marks for the internal evaluation components will be added to the external evaluation marks secured in the semester-end examinations, to arrive at total marks for any subject in that semester.

11.2. Performance in all the courses is tabulated course-wise and will be scrutinized by the Examination Committee and moderation is applied if needed, based on the recommendations of moderation committee and course-wise marks lists are finalized.

11.3. Student-wise tabulation is done and student-wise memorandum of marks is generated which is issued to the student.

12. SUPPLEMENTARY EXAMINATION

Supplementary examinations for the odd semester shall be conducted with the regular examinations of even semester and vice versa, for those who appeared and failed in regular examinations. Such of the candidates writing supplementary examinations may have to write more than one examination per day.

13. RE-REGISTRATION FOR IMPROVEMENT OF INTERNAL

Following are the conditions to avail the benefit of improvement of internal marks.

13.1. The candidate should have completed the course work and obtained examinations results for I & II semesters.

13.2. A candidate shall be given one chance for a maximum of Three Theory subjects for Improvement of Internal evaluation marks for which the candidate has to re-register for the chosen subjects and fulfill the academic requirements.

13.3. For each subject, the candidate has to pay a fee equivalent to one third of the semester tuition fee and the amount is to be remitted in the form of D.D. in favour of the Principal, Vardhaman College of Engineering payable at Hyderabad along with the requisition through the concerned Head of the Department.

13.4. In the event of availing the Improvement of Internal evaluation marks, the internal evaluation marks as well as the End Examinations marks secured in the previous attempt(s) for the re-registered subjects stand cancelled.

14. PERSONAL VERIFICATION

Students shall be permitted for personal verification of the semester-end examination answer scripts within a stipulated period after payment of prescribed fee.

15.   TRANSITORY REGULATIONS

Students who are detained for want of attendance (or) who have not fulfilled academic requirements (or) who have failed after having undergone the course in earlier regulations (or) have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same (or) equivalent subjects as and when subjects are offered, and pursue the remaining course work with the academic regulations of the batch into which such students are readmitted. A regular student has to satisfy all the eligibility requirements within the maximum stipulated period of four years for the award of M.Tech Degree.

16.   TRANSCRIPTS

After successful completion of the entire programme of study, a transcript containing performance of all academic years will be issued as a final record. Transcripts will also be issued, if required, after payment of requisite fee. Partial transcript will also be issued upto any point of study to a student on request, after payment of requisite fee.

17.   AWARD OF DEGREE

The degree will be conferred and awarded by Jawaharlal Nehru Technological University, Hyderabad on the recommendations of the Chairman, Academic Council.

17.1.   Eligibility

A student shall be eligible for the award of M.Tech. Degree, if he fulfills all the following conditions:

i.   Registered and successfully completed all the components prescribed in the programme of study to which he is admitted.

ii.   Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of study within the stipulated time.

iii.   Obtained not less than 50% of marks (minimum requirement for declaring as passed).

iv.   Has no dues to the college, hostel, and library etc. and to any other amenities provided by the College.

v.   No disciplinary action is pending against him.

17.2.   Award of Class

Declaration of Class is based on percentage of marks to be secured.

After a student has satisfied the requirement prescribed for the completion of the programme and is eligible for the award of M.Tech. Degree he shall be placed in one of the following four classes Shown in Table 4:

Table 4: Declaration of Class is based on percentage of marks to be secured

Class Awarded	% of marks to be secured	
First Class with Distinction	70% and above	From the aggregate marks secured for the 88 Credits.
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Fail	Below 50%	

Sometimes, it is necessary to provide equivalence of percentages and/or *Class* awarded with *Grade Point Average (GPA).* This shall be done by prescribing certain specific thresholds in averages for *Distinction, First Class and Second Class,* as in Table 5.

Table 5: Percentage Equivalence of *Grade Points* (For a 10-Point Scale)

Grade Point	Percentage of Marks / Class
5.75	50 (Second Class)
6.25	55
6.75	60 *(First Class)*
7.25	65
7.75	70 *(First Class with Distinction)*
8.25	75

18. REGISTRATION

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time.

19. TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the college in the following circumstances:

i. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

ii. The student fails to satisfy the norms of discipline specified by the institute from time to time.

20. CURRICULUM

20.1.   For each program being offered by the Institute, a Board of Studies (BOS) is constituted in accordance with AICTE / UGC / JNTUH statutes.

20.2.   The BOS for a program is completely responsible for designing the curriculum once in three years for that program.

21. WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the college / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

22. GRIEVANCES REDRESSAL COMMITTEE

"Grievance and Redressal Committee" (General) constituted by the principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. The composition of the complaints cum redressal committee shall be:
Headed by Senior Faculty member
Heads of all departments
A senior lady staff member from each department (if available)

The committee constituted shall submit a report to the principal of the college, the penalty to be imposed. The Principal upon receipt of the report from the committee shall, after giving an opportunity of being heard to the person complained against, submit the case with the committee's recommendation to the Governing Body of the college. The Governing Body shall confirm with or without modification the penalty recommended after duly following the prescribed procedure.

23. MALPRACTICE PREVENTION COMMITTEE

A malpractice prevention committee shall be constituted to examine and punish the students who does malpractice / behaves indiscipline in examinations. The committee shall consist of:

Principal
Subject expert of which the subject belongs to
Head of the department of which the student belongs to
The invigilator concerned
In-charge Examination branch of the college

The committee constituted shall conduct the meeting on the same day of examination or latest by next working day to the incidence and punish the student as per the guidelines prescribed by the J N T University, Hyderabad from time to time.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

24. AMENDMENTS TO REGULATIONS

The Academic Council of Vardhaman College of Engineering reserves the right to revise, amend, or change the regulations, scheme of examinations, and / or syllabi or any other policy relevant to the needs of the society or industrial requirements etc., without prior notice.

25. STUDENTS' FEEDBACK

It is necessary for the Colleges to obtain feedback from students on their course work and various academic activities conducted. For this purpose, suitable feedback forms shall be devised by the College and the feedback obtained from the students regularly in confidence, by administering the feedback form in print or on-line in electronic form.

The feedback received from the students shall be discussed at various levels of decision making at the College and the changes/ improvements, if any, suggested shall be given due consideration for implementation.

26. GRADUATION DAY

The College shall have its own annual *Graduation Day* for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

The College shall institute Prizes and Awards to meritorious students, for being given away annually at the *Graduation Day.* This will greatly encourage the students to strive for excellence in their academic work.

27. AWARD OF A RANK UNDER AUTONOMOUS SCHEME

27.1.   One (1) Merit Rank will be declared only for those students who have been directly admitted in VCE under Autonomous Regulations and complete the entire course in VCE only within the minimum possible prescribed time limit, i.e., 2 years for M.Tech.

27.2. A student shall be eligible for a merit rank at the time of award of degree in each branch of Master of Technology, provided the student has passed all subjects prescribed for the particular degree program in first attempt only.

27.5. Award of prizes, scholarships, or any other Honours shall be based on the rank secured by a candidate, consistent with the guidelines of the Donor, wherever applicable.

28. CONDUCT AND DISCIPLINE

28.1 Each student shall conduct himself / herself in a manner befitting his / her association with VCE.

28.2 He / she is expected not to indulge in any activity, which is likely to bring disrepute to the college.

28.3 He / she should show due respect and courtesy to the teachers, administrators, officers and employees of the college and maintain cordial relationships with fellow students.

28.4 Lack of courtesy and decorum unbecoming of a student (both inside and outside the college), wilful damage or removal of Institute's property or belongings of fellow students, disturbing others in their studies, adoption of unfair means during examinations, breach of rules and regulations of the Institute, noisy and unruly behaviour and similar other undesirable activities shall constitute violation of code of conduct for the student.

28.5 **Ragging in any form is strictly prohibited and is considered a serious offence. It will lead to the expulsion of the offender from the college.**

28.6 Violation of code of conduct shall invite disciplinary action which may include punishment such as reprimand, disciplinary probation, debarring from the examination, withdrawal of placement services, withholding of grades / degrees, cancellation of registration, etc., and even expulsion from the college.

28.7 Principal, based on the reports of the warden of Institute hostel, can reprimand, impose fine or take any other suitable measures against an inmate who violates either the code of conduct or rules and regulations pertaining to college hostel.

28.8 A student may be denied the award of degree / certificate even though he / she have satisfactorily completed all the academic requirements if the student is found guilty of offences warranting such an action.

28.9 Attendance is not given to the student during the suspension period.

29. OTHER ISSUES

The quality and standard of engineering professionals are closely linked with the level of the technical education system. As it is now recognized that these features are essential to develop the intellectual skills and knowledge of these professionals for being able to contribute to the society through productive and satisfying careers as *innovators, decision makers and/or leaders* in the global economy of the 21st century, it becomes necessary that certain improvements are introduced at different stages of their education system. These include:

i. Selective admission of students to a programme, so that merit and aptitude for the chosen technical branch or specialization are given due consideration.

ii. Faculty recruitment and orientation, so that qualified teachers trained in good teaching methods, technical leadership and students' motivation are available.

iii. Instructional/Laboratory facilities and related physical infrastructure, so that they are adequate and are at the contemporary level.

iv. Access to good library resources and Information & Communication Technology **(ICT)** facilities, to develop the student's *mind* effectively.

These requirements make it necessary for the College to introduce improvements like:

i. Teaching-learning process on modern lines, to provide *Add-On* Courses for *audit*/credit in a number of peripheral areas useful for students' self development.

ii. Life-long learning opportunities for faculty, students and alumni, to facilitate their dynamic interaction with the society, industries and the world of work.

iii. Generous use of ICT and other modern technologies in everyday activities.

30. GENERAL

Where the words "he", "him", "his", "himself" occur in the regulations, they include "she", "her", "herself".

Note: Failure to read and understand the regulations is not an excuse.

VARDHAMAN COLLEGE OF ENGINEERING
(Autonomous)

SYLLABUS
M. TECH - COMPUTER SCIENCE AND ENGINEERING

REGULATIONS: VCE--R11

I SEMESTER

Code	Subject	Periods per Week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B1201	Data Structures and Algorithms	3	-	3	40	60	100
B1202	Discrete Structures and Automata Theory	3	-	3	40	60	100
B1203	Computer Architecture and Organization	3	-	3	40	60	100
B1204	Software Engineering	3	-	3	40	60	100
	PROFESSIONAL ELECTIVE - I	3	-	3	40	60	100
	PROFESSIONAL ELECTIVE - II	3	-	3	40	60	100
B1211	Data Structures and Algorithms Lab	-	3	2	40	60	100
B1212	Technical Seminar	-	-	2	50	-	50
	TOTAL	**18**	**03**	**22**	**330**	**420**	**750**

II SEMESTER

Code	Subject	Periods per week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B1213	Computer Networks	3	-	3	40	60	100
B1214	Database Management Systems	3	-	3	40	60	100
B1215	Object Oriented Analysis and Design	3	-	3	40	60	100
B1216	Operating Systems	3	-	3	40	60	100
	PROFESSIONAL ELECTIVE - III	3	-	3	40	60	100
	PROFESSIONAL ELECTIVE - IV	3	-	3	40	60	100
B1221	Database Management Systems and Case Tools Lab	-	3	2	40	60	100
B1222	Technical Seminar	-	-	2	50	-	50
	TOTAL	**18**	**03**	**22**	**330**	**420**	**750**

III SEMESTER

Code	Subject	Periods per week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B1223	Comprehensive Viva	-	-	4	-	50-	50
B1224	Project Work Phase – I	-	-	18	50	-	50
	TOTAL	**-**	**-**	**22**	**50**	**50**	**100**

IV SEMESTER

Code	Subject	Periods per week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B1225	Project Work Phase – II	-	-	22	50	100	150
	TOTAL	**-**	**-**	**22**	**50**	**100**	**150**

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SYLLABUS
M. TECH - COMPUTER SCIENCE AND ENGINEERING

REGULATIONS: VCE--R11

ELECTIVES			
PROFESSIONAL ELECTIVE - I		**PROFESSIONAL ELECTIVE - II**	
Code	**Subject**	**Code**	**Subject**
B1205	Artificial Intelligence and Neural Networks	B1208	Web Technologies
B1206	Computer Vision and Graphics	B1209	Embedded Systems
B1207	Digital Image Processing and Pattern Recognition	B1210	C# and .Net Framework
PROFESSIONAL ELECTIVE - III		**PROFESSIONAL ELECTIVE - IV**	
Code	**Subject**	**Code**	**Subject**
B1217	Cloud Computing	B1218	Data Warehousing and Data Mining
B1505	Software Quality Assurance and Testing	B1219	Modern Compilers – Theory and Practice
B1506	Service Oriented Architecture	B1220	Distributed Computing

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I SEMESTER

DATA STRUCTURES AND ALGORITHMS

Course Code: **B1201**

	L	P	C
	3	-	3

UNIT - I
OVERVIEW OF DATA STRUCTURES: Review of arrays, stacks, queues, linked lists, linked stacks and linked queues, applications.

UNIT - II
ALGORITHM ANALYSIS: Efficiency of algorithms, apriori analysis, asymptotic notations, time complexity of an algorithm using o notation, polynomial vs. exponential algorithms, average, best and worst case complexities, analyzing recursive programs.

UNIT - III
TREES AND GRAPHS: Introduction, definition and basic terminologies of trees and binary trees, representation of trees and binary trees, binary tree traversals, threaded binary trees; Graphs basic concepts, representation and traversals.

UNIT - IV
BINARY SEARCH TREES, AVL TREES AND B -TREES: Introduction, binary search trees: definition, operations and applications. AVL trees: definition, operations and applications. B- trees: definition, operations and applications.

UNIT - V
RED BLACK TREES, SPLAY TREES AND HASH TABLES: Red black trees, splay trees and its applications. Hash tables: introduction to hash tables, hash functions and its applications.

UNIT - VI
DIVIDE AND CONQUER & GREEDY METHOD: General method, binary search, finding maximum and minimum, quick sort, merge sort, strassen's matrix multiplication. Greedy method, general method, minimum cost spanning trees, single source shortest path.

UNIT - VII
DYNAMIC PROGRAMMING: General method, all pairs shortest path, single source shortest path, 0/1 knapsack problem, reliability design, traveling sales person's problem.

UNIT - VIII
BACK TRACKING & BRANCH AND BOUND: General method, 8 queen's problem, graph coloring. Branch and bound, the general method, LC search, control abstraction, bounding 0 / 1 knapsack problem.

TEXT BOOKS:
1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran (2008), *Fundamentals of Computer Algorithms*, 2nd edition, University Press (India) Private Limited, India.
2. G. A. V. Pai (2009), *Data Structures and Algorithms*, Tata Mcgraw hill, New Delhi.

REFERENCE BOOKS:
1. D. Samanta (2003), *Classic Data Structures*, Prentice Hall of India Private Limited.
2. Aho, Hopcraft, Ullman (1998), *Design and Analysis of Computer Algorithms*, Pearson Education India.
3. Goodman, Hedetniemi (2002), *Introduction to the Design and Analysis of Algorithms*, Tata Mcgraw Hill, New Delhi, India.
4. Adam Drozdek (2005), *Data Structures and Algorithms in C++,* 3rd Edition, Thomson Course Technology.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

DISCRETE STRUCTURES AND AUTOMATA THEORY

Course Code: **B1202**

L	P	C
3	-	3

UNIT - I
MATHEMATICAL LOGIC: Statements and notations, connectives, well formed formulas, truth tables, tautology, equivalence implication, normal forms.

PREDICATES: Predicative logic, free and bound variables, rules of inference, consistency, proof of contradiction, automatic theorem proving.

UNIT - II
SET THEORY: Properties of binary relations, equivalence, compatibility and partial ordering relations, hasse diagram.

FUNCTIONS: Inverse function, composite of functions, recursive functions, lattice and its properties, pigeon hole principles and its application.

UNIT - III
ALGEBRAIC STRUCTURES: Algebraic systems, examples and general properties, semi groups and monads, groups and sub groups, homomorphism, isomorphism.

ELEMENTARY COMBINATORICS: Basis of counting, combinations and permutations with repetitions, constrained repetitions, binomial coefficients, binomial and multinomial theorems, the principles of inclusion exclusion.

UNIT - IV
RECURRENCE RELATION: Generating functions, function of sequences, calculating coefficient of generating function, recurrence relations, solving recurrence relation by substitution and generating functions, characteristics roots, solution of in homogeneous recurrence relation.

UNIT - V
AUTOMATA THEORY FUNDAMENTALS: Strings, alphabet, language, operations, finite state machine, definitions, finite automaton model, acceptance of strings and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and language recognizers.

FINITE AUTOMATA: NFA with Î transitions, significance, acceptance of languages. Conversions and equivalence: equivalence between NFA with and without Î transitions, NFA to DFA conversion, minimization of FSM.

UNIT - VI
REGULAR LANGUAGES: Regular sets, regular expressions, identity rules, constructing finite automata for a given regular expressions, conversion of finite automata to regular expressions. Pumping lemma of regular sets, closure properties of regular sets.

GRAMMAR FORMALISM: Regular grammars, right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, context free grammar, derivation trees, sentential forms.

UNIT - VII
CONTEXT FREE GRAMMARS: Ambiguity in context free grammars, minimization of context free grammars, chomsky normal form, greiback normal form, pumping lemma for context free languages, enumeration of properties of CFL.

PUSH DOWN AUTOMATA: Push down automata, definition, model, acceptance of CFL, acceptance by final state and acceptance by empty state and its equivalence, equivalence of CFL and PDA.

UNIT - VIII
TURING MACHINE: Turing machine, definition, model , design of TM, computable functions, recursively enumerable languages, church's hypothesis, counter machine, types of turing machines.

COMPUTABILITY THEORY: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR (0) grammar.

TEXT BOOKS:
1. J. P. Trembly, R. Manohar (1997), *Discrete Mathematical Structures with Applications to Computer Science*, Tata McGraw Hill, India.
2. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman(2005), *Introduction to Automata Theory Languages and Computation*, 2nd edition, Pearson Education, India.

REFERENCE BOOKS:
1. Joe L.Mott, Abraham Kandel (2004), *Discrete Mathematics for Computer Scientists and Mathematicians*, 2nd edition, Prentice Hall of India Private Limited, India.
2. Ralph P. Grimaldi, B. V .Ramana (2006), *Discrete and Combinatorial Mathematics- an Applied Introduction*, 5th edition, Pearson Education, India.
3. K.L.P Mishra, N. Chandrashekaran (2003), *Theory of Computer Science-Automata Languages and Computation*, 2nd edition, Prentice Hall of India Private Limited, India.
4. John C. Martin (2003), *Introduction to Languages and the Theory of Computation*, 3rd edition, Tata McGraw Hill.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

COMPUTER ARCHITECTURE AND ORGANIZATION

Course Code: **B1203**

	L	P	C
	3	-	3

UNIT - I
DIGITAL LOGIC CIRCUITS AND COMPONENTS: Digital computers, logic gates, boolean algebra, map simplifications. Combinational circuits: half-adder, full-adder, decoders, encoders. Multiplexer's, sequential circuits, flip flops, registers, shift registers, binary counters, memory unit.

UNIT - II
BASIC STRUCTURE OF COMPUTERS: Functional units, basic operational concepts, bus structures, software performance, multiprocessors and multi-computers. Data types, complements, fixed point representation, floating point representation, error detection codes.

UNIT - III
REGISTER TRANSFER LANGUAGE AND MICRO OPERATIONS: Register transfer language, register transfer bus and memory transfers, arithmetic micro operations, logic micro operations, shift micro operations, arithmetic logic shift unit. Instruction codes, computer registers, computer instructions, instruction cycle, memory reference instructions. Input/output and interrupt, stack organization, instruction formats, addressing modes. Data transfer and manipulation, program control, reduced instruction set computer.

UNIT - IV
DATA PATH DESIGN: Fixed point arithmetic, addition, subtraction, multiplication and division, combinational and sequential ALUs, carry look ahead adder, Robertson algorithm, booth's algorithm, non- restoring division algorithm, floating point arithmetic, coprocessor, pipeline processing, pipeline design, modified booth's algorithm.

UNIT - V
CONTROL DESIGN: Hardwired control, micro programmed control, multiplier control unit, CPU control unit, pipeline control, instruction pipelines, pipeline performance, superscalar processing, nano programming.

UNIT - VI
THE MEMORY SYSTEM: Basic concepts, semiconductor RAM memories, read-only memories, cache memories, performance, considerations, virtual memories, secondary storage, introduction to RAID.

UNIT - VII
INPUT-OUTPUT ORGANIZATION:
PERIPHERAL DEVICES: Input-output interface, asynchronous data transfer modes of transfer, priority interrupt direct memory access, input /output processor (IOP) serial communication; introduction to peripheral component interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB and IEEE1394.

UNIT - VIII
MULTI PROCESSORS: Characteristics or multiprocessors, interconnection structures, inter processor arbitration. Inter processor communication and synchronization cache coherance, shared memory multiprocessors.

TEXT BOOKS:
1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), *Computer Organization*, 5th edition, McGraw Hill, India.
2. M. Moris Mano (2008), *Computer Systems Architecture*, 3rd edition, Pearson Education, India.

REFERENCE BOOKS:
1. John P. Hayes (1998), *Computer architecture and Organisation*, 3rd edition, Tata McGraw-Hill, New Delhi.
2. William Stallings (2005), *Computer Organization and Architecture*, 6th edition, Prentice Hall of India.
3. Andrew S. Tanenbaum (1998), *Structured Computer Organization*, 4th edition, Prentice Hall of India.
4. Sivaraama Dandamudi (2003), *Fundamentals or Computer Organization and Design*, Springer Int. Edition, India.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

SOFTWARE ENGINEERING

Course Code: **B1204**

L	P	C
3	-	3

UNIT - I
SOFTWARE, SOFTWARE ENGINEERING AND PROCESS: The nature of software, the unique nature of web applications, software engineering, a layered technology, the essence and principles of software engineering practice, generic process model (framework), process patterns, process assessment and improvement, CMMI, software myths.

UNIT - II
PROCESS MODELS:
PRESCRIPTIVE PROCESS MODELS: The waterfall model, incremental process models, evolutionary process models. The unified process, aspect oriented software development, agile development, agile process, extreme programming.

UNIT - III
SOFTWARE REQUIREMENTS: Introduction to functional and non-functional requirements, requirements engineering activities, eliciting requirements, requirements modeling, requirements validation, software requirements specification (SRS), requirements management.

REQUIREMENTS MODELING:
STRUCTURED VIEW: Data modeling (ERD), functional modeling (DFD), behavioral modeling.

OBJECT ORIENTED VIEW: Use cases, CRC modeling, analysis classes, collaborations, responsibilities, object relationship model, object behavior model.

SOFTWARE PROJECT ESTIMATION: Empirical estimation models.

UNIT - IV
DESIGN CONCEPTS: Software design quality guidelines and attributes - design concepts.

SOFTWARE ARCHITECTURE: Architecture and its importance - architectural styles - data design - architectural design.

DESIGN:
STRUCTURED VIEW (TRADITIONAL VIEW): Architectural mapping using data flow (call and return architecture), interface design, function based component design.

OBJECT ORIENTED VIEW: Object oriented architecture, class hierarchies, message design, class based component design.

UNIT - V
PERFORMING USER INTERFACE DESIGN: Golden rules, user interface analysis and design, interface analysis, interface design steps.

PATTERN BASED DESIGN: Design patterns, pattern based software design, architectural patterns, component level design patterns, user interface design patterns.

UNIT - VI
TESTING:
SOFTWARE TESTING STRATEGIES: A strategic approach to software testing, test strategies (unit testing and integration testing) for conventional and object oriented software, validation testing, system testing, the art of debugging.

UNIT - VII
TESTING CONVENTIONAL APPLICATIONS: Software testing fundamentals.

WHITE-BOX TESTING: Basis path testing, condition (predicate) testing, data flow testing, loop testing.

BLACK BOX TESTING: Equivalence partitioning, boundary value analysis, graph based testing methods.

TESTING OBJECT ORIENTED APPLICATIONS: Object oriented testing methods, testing methods applicable at class level, interclass test case design.

UNIT - VIII
UMBRELLA ACTIVITIES: Risk management, software quality assurance, software configuration management.

MEASUREMENT AND METRICS: Size oriented metrics, function oriented metrics, metrics for software quality

PRODUCT METRICS: Metrics for the requirements model, metrics for the design model, metrics for source code, metrics for testing, metrics for maintenance.

SOFTWARE REENGINEERING: A software reengineering process model, software reengineering activities.

TEXT BOOKS:
1. Roger S. Pressman (2009), *Software Engineering: A practitioner's Approach*, 7th edition, McGraw Hill, India.
2. Lan Sommerville (2004), *Software Engineering*, 7th edition, Addison Wesley, India.

REFERENCE BOOKS:
1. K.K. Agarwal , Yogesh Singh(2008), *Software Engineering*, 1st edition, New Age International Private Limited, New Delhi, India.
2. James F. Peters, Witold Pedrycz (2000), *Software Engineering: An Engineering Approach*, John Wiely & Sons.
3. Gary B. Shelly, Thomas J. Cashman, Harry J. Rosenblatt (2007), *Systems Analysis and Design*, 7th edition, Cengage Learning, India..
4. Waman S. Jawadekar (2008), *Software Engineering: Principles and practice*, Tata McGraw Hill Publishing Company Limited, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS
(Professional Elective - I)

Course Code: **B1205**

L	P	C
3	-	3

UNIT - I
INTRODUCTION TO ARTIFICIAL INTELLIGENCE: Problem and search, what is AI technique, criteria for success; problems, problem space and search, defining the problem as a state space search, production systems, problem characteristics, production system characteristics.

HEURISTIC SEARCH TECHNIQUES: Knowledge representation, knowledge representation issues, using predicate logic, resolution principle. Representing knowledge using rules, forward vs backward reasoning, symbolic reasoning under uncertainty, non monotonic reasoning, statistical reasoning.

UNIT - II
DIFFERENT KNOWLEDGE REPRESENTATION SCHEMES: Semantic nets, Marvin minsky's frames, conceptual dependency theory, scripts. Understanding, what is understanding, what makes understanding hard, understanding as constraint satisfaction, waltz's algorithm.

UNIT - III
NATURAL LANGUAGE PROCESSING: Overview of linguistics, grammars and languages, basic parsing techniques, transitional networks, semantic analysis and representation structures. Natural language generation, natural language systems, general concepts in knowledge acquisition. Types of learning, general learning model, performance measures, early work in machine learning, perceptrons, genetic algorithms, intelligent editors.

UNIT - IV
EXPERT SYSTEM ARCHITECTURE: Characteristic features of expert systems, history, applications. Rule based system architecture, expert system shells. Pattern recognition, the recognition and classification process, learning classification patterns, recognizing and understanding speech. Perception and action, features of AI programming language PROLOG.

UNIT - V
INTRODUCTION TO NEURAL NETWORKS: What is a neural network?, human brain, models of neuron, neural networks viewed as directed graphs, feedback, network architectures, knowledge representation, artificial intelligence and neural networks.

UNIT - VI
LEARNING PROCESSES: Introduction, error-correction learning, learning with a teacher, learning without a teacher, learning tasks, statistical nature of the learning process, statistical learning theory, probably approximately correct model of learning.

UNIT – VII
SINGLE LAYER PERCEPTRONS
Introduction, adaptive filtering problem, unconstrained optimization techniques, linear least-squares filters, least-mean square algorithm, learning curves, learning rate annealing techniques, perceptron, perceptron convergence theorem, relation between the perceptron and bayes classifier for a gaussian environment.

MULTILAYER PERCEPTRONS
Introduction, some preliminaries, back-propagation algorithm, summary of back-propagation algorithm, XOR problem.

UNIT - VIII
HEURISTICS: Heuristics for making the back propagation algorithm perform better, output representation and decision rule, computer experiment, feature detection, back-propagation and differentiation, hessian matrix, generalization, approximation of functions, cross validation, network pruning techniques, virtues and limitations of back- propagation learning, accelerated convergence of back propagation learning, supervised learning viewed as an optimization problem, convolution networks.

TEXT BOOKS:
1.   Elaine Rich, Kevin Knight (2002), *Artificial Intelligence,* 2nd edition, Tata McGraw Hill, New Delhi.
2.   Simon Haykin (1999), *Neural Networks: a Comprehensive Foundation*, 2nd edition, Pearson Education, India.

REFERENCE BOOKS:
1.   Patrick Henry Winston (2001), *Artificial Intelligence,* 3rd edition, Pearson Education Private Limited, India.
2.   Dan W. Patterson (1999), I*ntroduction to Artificial Intelligence and Expert Systems,* Prentice Hall of India.
3.   Satish Kumar (2004), *Neural Networks: A classroom approach*, Tata McGraw Hill, New Delhi.
4.   N. J Nilsson (2005), *Principles of Artificial Intelligence*, Morgan Kaufmann.
5.   B. Yegnanarayana (2001), *Artificial Neural Networks*, Prentice Hall of India.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

COMPUTER VISION AND GRAPHICS
(Professional Elective - I)

Course Code: **B1206**

L	P	C
3	-	3

UNIT - I
CAMERAS: Pinhole cameras, camera with lenses, the human eye sensing. Radiometry, measuring light: light in space, light at surfaces, important special cases.

UNIT - II
SOURCES - SHADOWS AND SHADING: Qualitative radiometry- sources and their effects- local shading models- application: photometric stereo- inter reflections: global shading models.

UNIT - III
LINEAR FILTERS: Linear filters and convolution, shift invariant linear systems, spatial frequency and Fourier transforms, sampling and aliasing, filters as templates technique: normalized correlation and finding patterns technique: scale and image pyramids.

UNIT - IV
EDGE DETECTION: Noise estimating derivatives, detecting edges.

TEXTURE: Representing texture, analysis using oriented pyramids and application: synthesizing textures for rendering shape for texture for planes.

UNIT - V
BASIC RASTER GRAPHICS ALGORITHMS: Basic raster graphics algorithms for drawing 2D primitives, liner circles, ellipses, arcs, clipping, clipping circles, ellipses and polygon.

UNIT - VI
POLYGON MESHES IN 3D CURVES: Cubic and surfaces, solid modeling. Geometric transformation: 2D to 3D transformations, window to viewport transformations, aromatic and color models.

UNIT - VII
SHADING TECHNIQUES: Transparency, shadows, object reflection, gouraud and phong shading techniques. Visible surface determination techniques for visible line determination, Z-buffer algorithm, scanline algorithm, algorithm for octtres, algorithm for curve surfaces, visible surfaces ray tracing, recursive ray tracing, radio city methods.

UNIT - VIII
ELEMENTARY FILTERING TECHNIQUES: Elementary image processing techniques, geometric and multi-pass transformation mechanisms for image storage and retrieval.

TEXT BOOKS:
1. David A. Forsyth, Jean Ponce (2003), *Computer Vision: A Modern Approach*, Prentice Hall of India.
2. Foley et. al (2000), *Computer Graphics Principles & practice*, 2nd edition, Addison Wesley, India.
3. D. Hearn and P. Baker (1986), *Computer Graphics*, Prentice Hall of India.

REFERENCE BOOKS:
1. Sommer (2001), *Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics*, 1st edition, Springer.
2. Sonka (2008), *Digital Image Processing and Computer Vision*, 1st edition, Thomson Learning.
3. Jack (2000), *Computer Vision and Applications: Concise Edition (With CD),* Academy Press.
4. W. Newman, R. Sproul (1973), *Principles of Interactive Computer Graphics*, McGraw-Hill, New Delhi.
5. David F. Rogers (1985), *Procedural Elements for Computer Graphics*, McGraw Hill Book Company, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

DIGITAL IMAGE PROCESSING AND PATTERN RECOGNITION
(Professional Elective - I)

Course Code: **B1207**

	L	P	C
	3	-	3

UNIT - I
DIGITAL IMAGE FUNDAMENTALS: Introduction, digital image through scanner, digital camera, concept of gray levels gray level to binary image conversion, sampling and quantization, relation ship between pixels, imaging geometry.

UNIT - II
IMAGE TRANSFORMS: 2D FFT- properties, Walsh transform, hadamard transform, discrete cosine transform, haar transform, slant transform, hotelling transform.

UNIT - III
IMAGE ENHANCEMENT: Point processing, histogram processing, spatial filtering, enhancement in frequency domain, image smoothing, image sharpening.

UNIT - IV
IMAGE RESTORATION: Degradation model, algebraic approach to restoration, inverse filtering, least mean square filters, constrained least squares restoration, interactive restoration.

UNIT - V
IMAGE SEGMENTATION: Detection of discontinuities, edge linking and boundary detection, thresholding, region oriented segmentation.

UNIT - VI
IMAGE COMPRESSION: Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder, error free compression, lossy compression.

UNIT - VII
BASICS OF PATTERN RECOGNITION: Bayesian decision theory, classifiers, discriminant functions, decision surfaces, normal density and discriminant functions, discrete features.

UNIT - VIII
PARAMETER ESTIMATION METHODS: Maximum-likelihood estimation, gaussian mixture models, expectation-maximization method, bayesian estimation.

TEXT BOOKS:
1. R. C. Gonzalez, R. E. Woods (2002), *Digital Image processing*, 2nd edition, Addison Wesley, India.
2. S. Theodoridis, K. Koutroumbas (2009), *Pattern Recognition*, 4th edition, Academic Press.

REFERENCE BOOKS:
1. Anil K. Jain, Jain (1997), *Fundamentals of Digital Image processing*, Prentice Hall of India Private Limited.
2. Rafael C. Gonzalez, Richard E. Woods and Steven. L (2004), *Digital Image processing using MAT LAB*, Pearson Education Asia.
3. William K. Pratt (2004), *Digital Image Processing*, 3rd edition, John Wilely, India.
4. R. O. Duda, P .E. Hart and D. G. Stork(2001), *Pattern Classification*, John Wiley, India.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

WEB TECHNOLOGIES
(Professional Elective - II)

Course Code: **B1208**

L	P	C
3	-	3

UNIT - I

INTRODUCTION TO HTML: Basic HTML, the document body, text, hyperlinks, lists, tables, images, frames, forms, Cascading Style Sheets: Introduction, simple examples, defining your own styles, properties and values in styles, formatting blocks of information, layers.

UNIT - II

JAVA SCRIPT: Basics, variables, string manipulation, arrays, functions, objects in java script, introduction to DHTML.

UNIT - III

EXTENSIBLE MARK-UP LANGUAGE (XML):

XML basics, document type definition, XML schema, presenting XML, introduction to DOM and SAX parsers.

UNIT - IV

DATABASE PROGRAMMING WITH JDBC: Database drivers, the java.sql package: connection management, database access, data types, database metadata, exceptions and warnings, loading a database driver and opening connections, establishing a connection, creating and executing SQL statements querying the database, prepared statements, mapping SQL types to java, transaction support, save points.

UNIT - V

SERVLET PROGRAMMING: Introduction, servlet implementation, servlet configuration, servlet exceptions, servlet lifecycle. Requests and responses: servletrequest, servletresponse, httpServletrequest, httpServletresponse interfaces, cookies, session creation and tracking using httpsession interface.

UNIT - VI

INTRODUCTION TO JSP: Introducing JSP, JSP directives, scripting elements, standard actions, implicit objects, scope and JSP pages as XML documents, introduction to MVC architecture.

UNIT - VII

JSP TAG EXTENSIONS: Introduction to javabean, advantages of javabean, introspection**,** getter and setter methods, introduction to JSP tag extensions, a simple tag, anatomy of a tag extension, writing tag extensions.

UNIT - VIII

JSP APPLICATIONS WITH TAG LIBRARIES: Benefits of using custom tag libraries, introducing the JSP standard tag library (JSPTL), getting started with the JSPTL, integrating the JSPTL into your JSP page, the JSPTL tags.

TEXT BOOKS:

1.   Chris Bates (2007), *Web Programming Building Internet Applications*, 2nd edition, Wiley.
2.   Subrahmanyam A, Cedric Buest (2004), *Professional Java Server Programming J2EE*, 1.3 Edition, SPD (apress).

REFERENCE BOOKS:

1.   Dietel, Dietel (2009), *Internet and World Wide Web, How to program*, 4th edition, Pearson Education, India.
2.   Watt, Jeff Rafter (2004), *Beginning XML,* Wiley Dreamtech, India.
3.   J. McGovern, Rahim Adatia, Yakov Fain (2004), *J2EE 1.4 Bible*, Wiley Dreamtech, India.
4.   Hans Bergsten (2004), *Java Server Pages*, 3nd edition, SPD O'Reilly, India.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

EMBEDDED SYSTEMS
(Professional Elective - II)

Course Code: **B1209**

L	P	C
3	-	3

UNIT – I
EMBEDDED COMPUTING: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples.

UNIT – II
THE 8051 ARCHITECTURE: Introduction, 8051 micro controller hardware, input/output ports and circuits, external memory, counter and timers, serial data input/output, interrupts.

UNIT – III
BASIC ASSEMBLY LANGUAGE PROGRAMMING CONCEPTS: The assembly language programming process, programming tools and techniques, programming the 8051. Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions, further details on interrupts.

UNIT – IV
APPLICATIONS: Interfacing with keyboards, displays, D/A and A/D conversions, multiple interrupts, serial data communication.

UNIT – V
INTRODUCTION TO REAL-TIME OPERATING SYSTEMS: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

UNIT – VI
BASIC DESIGN USING A REAL-TIME OPERATING SYSTEM: Principles, semaphores and queues, hard real-time scheduling considerations, saving memory and power, an example RTOS like uC-OS (open source).

UNIT – VII
EMBEDDED SOFTWARE DEVELOPMENT TOOLS: Host and target machines, linker/locators for embedded software, getting embedded software into the target system

DEBUGGING TECHNIQUES: Testing on host machine, using laboratory tools, an example system.

UNIT – VIII
INTRODUCTION TO ADVANCED ARCHITECTURES: ARM and SHARC, processor and memory organization and instruction level parallelism; networked embedded systems: bus protocols, I^2C bus and CAN bus; internet-enabled systems, design example-elevator controller.

TEXT BOOKS:
1. Wayne Wolf (2008), *Computers as Components-principles of embedded computer system design*, Elseveir, India.
2. Kenneth J. Ayala (2008), *The 8051 Microcontroller*, 3rd edition, Cengage Learning, India.
3. David E. Simon (1999), *An Embedded Software Primer*, Pearson Education, India.

REFERENCE BOOKS:
1. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
2. Raj Kamal (2004), *Embedded Systems*, Tata Mcgraw hill, India.
3. Ajay V. Deshmukh (2005), *Micro Controllers*, Tata Mcgraw hill, India.
4. Frank Vahid, Tony Givargis (2002), *Embedded System Design*, John Wiley, India.

VARDHAMAN COLLEGE OF ENGINEERING
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I SEMESTER

C# AND .NET FRAMEWORK
(Professional Elective - II)

Course Code: **B1210**

	L	P	C
	3	**-**	**3**

UNIT – I
C# LANGUAGE FUNDAMENTS: Basic class, constructors, composing an application, variable scope, input and output with console class, value types, reference types, system .object, system data types, boxing and unboxing, constants, iteration constructs, flow constructs, operators, class methods, static methods, modifiers, arrays, strings, enumerations, structures, name spaces.

UNIT - II
OBJECT ORIENTED PROGRAMMING WITH C#: Definition of a class, default public interface, encapsulation, read only fields, inheritance support, protected keyword, nested type definitions, polymorphism, type casting, class definitions.

UNIT - III
EXCEPTIONS AND OBJECT LIFETIME: Errors, bugs, exceptions, system. Exception, throwing, catching.system. System exception, system. application exception, handling multiple exceptions, finally, last change system level exceptions, debugging system exceptions, object life time, garbage collection, finalization, destruction method, system. GC type.

UNIT - IV
INTERFACES AND COLLECTIONS, CALLBACK INTERFACES, DELEGATES AND EVENTS: Defining, invoking, exercising hierarchy, interface implementation, building interface hierarchies, understanding iconvertible interface, custom enumerator, icloneable, icomparable, system. Collections, callback interfaces, system. Multicastdelegate, examples, asynchronous delegates, understanding events.

UNIT - V
.NET ASSEMBLY, PROCESSES, APPDOMAINS, CONTEXTS AND THREADS: Overview of .net assembly, cross language inheritance, multi-file assembly, private assembly, xml configuration files, shared assemblies, strong names. Process and threads, interaction with process, system. Appdomain, summarizing processes, appdomains, and context, multi thread programming via delegates, spanning secondary threads, examples, concurrency, lock key word, system. threading. Interlocked type, timer call backs.

UNIT - VI
OBJECT SERIALIZATION AND .NET REMOTING LAYER: Object graphs, serialization using binary formatter, SOAP formatter, xml formatter, .net remoting, object marshaling, MBR objects, MBV objects, asynchronous remoting, onewayattribute.

UNIT - VII
WINDOWS FORMS, WINDOWS FORM CONTROLS: System.windows.forms, interactions with windows forms types, system.windows.forms.application, component class, control class, control events key board events, scrollablecontrol class, containercontrol class, form class, life-cycle, handling form events, menus with windows forms, status bars, tool bar, MDI application, windows forms control hierarchy, controls to forms, text box control, check boxes, radiobuttons, groupboxes, listboxes, comboboxes, monthcalendar control, trackbar, panel controls, dialog boxes, form inheritance.

UNIT - VIII
DATA ACCESS WITH ADO .NET: ADO.net, data providers, system.data, datacolumn type, datarow type, datatable, dataview, dataset, datarelation, XML based dataset, selecting a data provider, system.data.oledb namespace, oledbdatareader, insertion, updation and deletion of records, stored procedures, oledbdataadapter, example.

TEXT BOOKS:
1. Andrew Troelsen (2007), *C# and the .NET Platform*, 2nd edition, Springer (India) Private Limited, New Delhi.

REFERENCE BOOKS:
1. E. Balagurusamy (2004), *Programming in C#,* 5th edition, Tata McGraw-Hill, New Delhi, India.
2. Herbert Schildt (2004), *The Complete Reference: C#,* Tata McGraw-Hill, New Delhi, India.
3. Simon Robinson, Christian Nagel, Karli Watson, Jay Gl (2006), *Professional C#*, 3rd edition, Wiley-India.
4. Jesse Liberty (2003), *Programming C#,* 3rd edition, O'Reilly Media, Inc.

VARDHAMAN COLLEGE OF ENGINEERING
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DATA STRUCTURES AND ALGORITHMS LAB

Course Code: **B1211**

	L	P	C
	-	3	2

LIST OF EXERCISES:

Exercise 1:
a)   Write a C program that implement stack (its operations) using arrays
b)   Write a C program that uses Stack operations to convert infix expression into postfix expression

Exercise 2:
a)   Write C programs that implement Queue (its operations) using arrays
b)   Write C programs that implement Queue (its operations) using linked lists

Exercise 3:
a)   Write a C program that uses functions to create a singly linked list
b)   Write a C program that uses functions to perform insertion operation on a singly linked list
c)   Write a C program that uses functions to perform deletion operation on a singly linked list

Exercise 4:
Write a C program to perform the following operations:
   a)   Insert an element into a binary search tree
   b)   Delete an element from a binary search tree
   c)   Search for a key element in a binary search tree

Exercise 5:
Write a C program to perform the following operations on B -Trees and AVL-trees:
   a)   Insertion   b) Deletion

Exercise 6:
Write C programs for the implementation of BFS and DFS for a given graph.

Exercise 7:
Write C programs to implement the following to generate a minimum cost spanning tree:
   a)   Prim's algorithm b) Kruskal's algorithm.

Exercise 8:
Write a C program to solve the single source shortest path problem. (Note: Use Dijkstra's algorithm).

Exercise 9:
Write C program that uses non-recursive functions to traverse a binary tree in:
   a) Pre-order   b) In-order   c) Post-order

Exercise 10:
Write a C program to find optimal ordering of matrix multiplication. (Note: Use Dynamic programming method).

Exercise 11:
Consider the problem of eight queens on an (8x8) chessboard. Two queens are said to attack each other if they are on the same row, column, or diagonal. Write a C program that implements backtracking algorithm to solve the problem i.e. place eight non - attacking queens on the board.

Exercise 12:
Write a C program to implement dynamic programming algorithm to solve the all pairs shortest path problem.

Exercise 13:
Write a C program to solve 0/1 knapsack problem using the following:
   a) Greedy algorithm   b) Dynamic programming algorithm
   c) Backtracking algorithm   d) Branch and bound algorithm.

Exercise 14:
Write a C program that uses dynamic programming algorithm to solve the optimal binary search tree problem.

Exercise 15:
Write a C program for solving traveling sales persons problem using the following:
   a) Dynamic programming algorithm   b) The back tracking algorithm   c) Branch and Bound

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II SEMESTER

COMPUTER NETWORKS

Course Code: **B1213**

L	P	C
3	-	3

UNIT - I
FOUNDATION OF NETWORKING PROTOCOLS: 5-layer TCP/IP model, 7-layer OSI model, internet protocols and addressing, equal-sized packets model, ATM.

REVIEW OF COMPUTER NETWORKS AND THE INTERNET: What is the internet, the network edge, the network core, access networks and physical media, ISPs and internet backbones, delay and loss in packet-switched networks, history of computer networking and the internet.

UNIT -II
NETWORKING DEVICES: Multiplexers, modems and internet access devices, switching and routing devices, router structure.

THE LINK LAYER AND LOCAL AREA NETWORKS: Link layer, introduction and services, error detection and error correction techniques, multiple access protocols, link layer addressing, ethernet, interconnections, hubs and switches, PPP - the point to point protocol, link virtualization.

UNIT - III
ROUTING AND INTERNETWORKING: Network layer routing, least cost path algorithms, non least cost path algorithms, intradomain routing protocols, interdomain routing protocols, congestion control at network layer. Logical addressing, IPv4 addresses, IPv6 addresses. Internet protocol, internetworking, IPv4, IPv6, transition from IPv4 to IPv6.

MULTICASTING TECHNIQUES AND PROTOCOLS: Basic definitions and techniques, intradomain multicast protocols, interdomain multicast protocols, node level multicast algorithms.

UNIT - IV
TRANSPORT AND END-TO-END PROTOCOLS: Transport layer, transport services, connection management, transmission control protocol (TCP), user datagram protocol (UDP), mobile transport protocols, TCP congestion control.

UNIT -V
APPLICATION LAYER: Principles of network applications, the web and http. File transfer – FTP, electronic mail in the internet domain name system (DNS), P2P file sharing, socket programming with TCP and UDP, building a simple web server.

UNIT - VI
WIRELESS NETWORKS AND MOBILE IP: Infrastructure of wireless networks, wireless LAN technologies- IEEE 802.11 wireless standard, cellular networks, mobile IP, wireless mesh networks (WMNs).

UNIT -VII
OPTICAL NETWORKS AND WDM SYSTEMS: Overview of optical networks, basic optical networking devices, large scale optical switches, optical routers, wavelength allocation in networks, case study, an all optical switch.

UNIT -VIII
VPNS - TUNNELING AND OVERLAY NETWORKS: Virtual Private Networks (VPNs), multiprotocol label switching (MPLS), overlay networks.

VOIP AND MULTIMEDIA NETWORKING: Overview of IP telephony, VOIP signaling protocols, real time media transport protocols, distributed multimedia networking, stream control transmission protocol.

TEXT BOOKS:
1. James F. Kurose, Keith W. Ross (2007), *Computer Networking: A Top down Approach Featuring the Internet*, 3rd edition, Pearson Education, India.
2. Nader F. Mir (2007), *Computer and Communication Networks*, Pearson Education, India.

REFERENCE BOOKS:
1. Behrouz A. Forouzan (2007), *Data Communications and Networking*, 4th edition, Tata McGraw Hill, India.
2. S. Keshav (2008), *An Engineering Approach to Computer Networking,* 3rd edition, Pearson Education, Asia.
3. Andrew S. Tanenbaum (2009), *Computer Networks*, 4th edition, Pearson Education, Asia.

VARDHAMAN COLLEGE OF ENGINEERING

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II SEMESTER

DATABASE MANAGEMENT SYSTEMS

Course Code: **B1214**

	L	P	C
	3	-	3

UNIT - I
INTRODUCTION: Databases and database users, database system concepts and architecture, data modeling using the entity- relationship model, the enhanced entity-relationship model.

UNIT - II
DATABASE DESIGN: Theory and methodology, functional dependencies and normalization for relational databases, relational database design and algorithms and further dependencies.

UNIT - III
THE RELATIONAL DATA MODEL AND RELATIONAL DATABASE CONSTRAINTS: Relational algebra, relational calculus-tuple relational calculus, domain relational calculus. SQL-99 schema definitions, constraints.

UNIT - IV
INTRODUCTION TO SQL PROGRAMMING TECHNIQUES: Introduction to PL/SQL, more on PL/SQL. Database objects, stored procedures and functions, advantages of using a procedure or function, procedure versus functions, syntax for creating, deleting stored procedure and functions.

UNIT - V
DISK STORAGE: Basic file structures and hashing, indexing structures for files, algorithms for query processing and optimization.

UNIT - VI
INTRODUCTION TO TRANSACTION PROCESSING CONCEPTS AND THEORY: Concurrent control techniques, database recovery techniques.

UNIT - VII
DISTRIBUTED DATABASE: An overview, levels of distribution transparency, distributed database design, translation of global queries to fragment queries.

UNIT - VIII
DATABASE SECURITY: Concepts for object databases, enhanced data models for advanced applications, web database programming, emerging database technologies and applications.

TEXT BOOKS:
1. Abraham Silberchatz, Henry F. Korth, S. Sudarsan (2006), *Database System Concepts*, 5th edition, McGraw-Hill.
2. Stefano Ceri, Giuseppe Pelagatti(2008), *Distributed Databases Principles and Systems*, 2nd edition, Tata McGraw-Hill Education, New Delhi.
3. Ivan Bayross (2003), *SQL, PL/SQL: The Programming* language *of Oracle,* 3rd edition, BPB Publications, India.

REFERENCE BOOKS:
1. Ramez Elmasri, Shamkant B. Navathe (2008), *Fundamentals of Database Systems*, 5th edition, Pearson Education, India.
2. Thomas M. Connolly, Carolyn E. Begg(2003), *Database Systems - A Practical Approach to Design, Implementation and Management*, 3rd edition, Pearson Education.
3. Jefrey D. Ullman, Jenifer Widom (2001), *A First Course in Database Systems*, Pearson Education Asia.
4. Rajesh Narang (2002), *Object Oriented Interfaces and Databases*, Prentice Hall of India.

VARDHAMAN COLLEGE OF ENGINEERING
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II SEMESTER

OBJECT ORIENTED ANALYSIS AND DESIGN

Course Code: **B1215**

L	P	C
3	-	3

UNIT - I
OBJECT ORIENTED CONCEPTS: The meaning of object orientation, object identity, encapsulation, information hiding, polymorphism.

INTRODUCTION TO UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, architecture.

UNIT - II
BASIC STRUCTURAL MODELING: Classes, relationships, common mechanisms, diagrams.

CLASS AND OBJECT DIAGRAMS: Terms, concepts, modeling techniques for class and object diagrams.

UNIT - III
INTERACTION DIAGRAMS:
SEQUENCE DIAGRAMS: Terms, concepts, depicting asynchronous messages with/without priority, call back mechanism, broadcast messages, common modeling techniques.

COLLABORATION DIAGRAMS: Terms, concepts, depicting a message, polymorphism in collaboration diagram, iterated messages, use of self messages, common modeling techniques.

UNIT - IV
BASIC BEHAVIORAL MODELING: Use cases, use case diagrams, activity diagrams.

ADVANCED BEHAVIORAL MODELING: Events and signals, state machines, processes and threads, time and space, state chart diagrams.

UNIT - V
ARCHITECTURAL MODELING: Component, deployment, component diagrams and deployment diagrams.

UNIT - VI
THE UNIFIED PROCESS: Use case driven, architecture centric, iterative and incremental.

THE FOUR Ps: People, project, product and process.

USE CASE DRIVEN PROCESS: Why use case, capturing use cases, analysis, design and implementation to realize the use cases, testing the use cases.

ARCHITECTURE CENTRIC PROCESS: Architecture in brief, why we need architecture, use cases and architecture, the steps to architecture, an architecture description.

ITERATIVE INCREMENTAL PROCESS: Iterative incremental in brief, why iterative incremental development? The iterative approach is risk driven, the generic iteration.

UNIT -VII
INCEPTION PHASE: Early in the inception phase, the archetypal inception iteration workflow, execute the core workflows, requirements to test.

ELABORATION PHASE: Elaboration phase in brief, early in the elaboration phase, the architectural elaboration iteration workflow, execute the core workflows, requirements to test.

UNIT - VIII
CONSTRUCTION PHASE: Early in the construction phase, the archetypal construction iteration workflow, execute the core workflow.

TRANSITION PHASE: Early in the transition phase, activities in transition phase.

CASE STUDIES: Automation of a library, software simulator application (2-floor elevator simulator).

TEXT BOOKS:
1. Grady Booch, James Rumbaugh, Ivar Jacobson (2005), *The Unified Modeling Language User Guide*, 2nd edition, Pearson Education.
2. Ivar Jacobson, Grady Booch, James Rumbaugh (2009), *The Unified Software Development Process*, 5th edition, Pearson Education, India.

REFERENCE BOOKS:
1. Hans Erik Eriksson, Magnus Penker, Brian Lyons (2009), *UML 2 Toolkit*, WILEY Dreamtech India Private Limited, New Delhi, India.
2. Meilir Page Jones (2000), *Fundamentals of Object Oriented Design in UML*, Pearson Education, India.
3. Atul Kahate (2007), *Object Oriented Analysis and Design*, Tata McGraw-Hill, New Delhi, India.
4. Mark Priestley (2005), *Practical Object-Oriented Design with UML*, 2nd edition, Tata McGraw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING
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II SEMESTER

OPERATING SYSTEMS

Course Code: **B1216**

	L	P	C
	3	-	3

UNIT - I
INTRODUCTION: Operating system concept, processes and threads, process model, process creation, process termination, process hierarchies, and process states, implementation of processes, threads, thread model, thread usage, implementation of threads in user space and kernel, hybrid implementations.

UNIT - II
INTER PROCESS COMMUNICATION: Race conditions, critical regions, mutual exclusion with busy waiting, sleep and wakeup, semaphores, mutexes, monitors, message passing; scheduling- scheduling in batch systems, interactive systems, real time systems, thread scheduling.

UNIT - III
DEADLOCKS: Introduction, deadlock detection and recovery, deadlock detection with one resource of each type, with multiple resource of each type, recovery from deadlock; deadlock avoidance, deadlock prevention.

UNIT - IV
MEMORY MANAGEMENT: Memory management and virtual memory, logical versus physical address space, swapping, contiguous allocation, paging, segmentation, segmentation with paging. Demand paging, performance of demanding paging, page replacement, page replacement algorithm, allocation of frames, thrashing.

UNIT - V
FILE SYSTEM MANAGEMENT : File system interface and implementation, access methods, directory structure, protection, file system structure, file system management, organization of file system, file permissions, MS DOS and UNIX file system case studies, NTFS; device management- I/O channels, interrupts and interrupt handling, types of device allocation.

UNIT - VI
INTRODUCTION TO DISTRIBUTED SYSTEMS: Goals of distributed system, hardware and software concepts, design issues. Communication in distributed systems- layered protocols, ATM networks, the client / server model, remote procedure call and group communication.

UNIT - VII
SYNCHRONIZATION IN DISTRIBUTED SYSTEMS: Clock synchronization, mutual exclusion, e-tech algorithms, the bully algorithm, a ring algorithm, atomic transactions.

UNIT - VIII
DEADLOCKS: Deadlock in distributed systems, distributed deadlock prevention, and distributed dead lock detection.

TEXT BOOKS:
1.   Abraham Silberchatz, Peter B. Galvin, Greg Gagne (2008), *Operating System Principles*, 8th edition, John Wiley & Sons, Inc.
2.   Andrew S. Tanenbaum (2001), *Distributed Operating Systems*, 2nd edition, Pearson Education, India.

REFERENCE BOOKS:
1.   Mukesh Singhal, Niranjan (2001), *Advanced Concepts in Operating Systems*, Tata Mcgraw Hill, New Delhi.
2.   Andrew S. Tanenbaum (2006), *Modern Operating Systems*, 2nd edition, Pearson Education, India.
3.   Pradeep K. Sinha (2002), *Distributed Operating Systems and concepts*, Prentice Hall of India.
4.   William Stallings (2005), *Operating Systems: Internals and Design Principles*, 5th edition, Pearson Education.

VARDHAMAN COLLEGE OF ENGINEERING
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CLOUD COMPUTING
(Professional Elective - III)

Course Code: **B1217**

L	P	C
3	-	3

UNIT - I
CLOUD COMPUTING BASICS: Cloud computing overview, applications, intranets and the cloud, first movers in the cloud.

UNIT - II
YOUR ORGANIZATION AND CLOUD COMPUTING: When you can use cloud computing, benefits, limitations, security concerns, regulatory issues.

CLOUD COMPUTING WITH THE TITANS: Google, EMC, netapp, Microsoft, Amazon, salesforce.com IBM, partnerships.

UNIT - III
THE BUSINESS CASE FOR GOING TO THE CLOUD: Cloud computing services, how those applications help your business, deleting your datacenter, salesforce.com and Thomson reuters.

UNIT - IV
HARDWARE AND INFRASTRUCTURE: Clients, security, network, services.

ACCESSING THE CLOUD: Platforms, web applications, web APIs, web browsers.

UNIT - V
CLOUD STORAGE VENDORS: Overview of cloud storage, cloud storage providers.

STANDARDS: Application, client, infrastructure, service.

UNIT - VI
DEVELOPING CLOUD SERVICES: Types of cloud service development, software as a service: overview, driving forces, company offerings, industries, software plus services**:** overview, mobile device integration, providers, microsoft online, platform as a service, web services, on-demand computing, discovering cloud services, development services and tools.

UNIT - VII
DEVELOPING APPLICATIONS: Google, Microsoft, intuit quick base, cast iron cloud, bungee connect development, troubleshooting, application management.

LOCAL CLOUDS AND THIN CLIENTS: Virtualization in your organization, server solutions, thin client's case study: Mcneilus steel.

UNIT - VIII
MIGRATING TO THE CLOUD: Cloud services for individuals, cloud services aimed at the mid-market, enterprise-class cloud offerings, migration.

BEST PRACTICES AND THE FUTURE OF CLOUD COMPUTING: Analyze your service, best practices, how cloud computing might evolve.

TEXT BOOKS:
1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter(2010), *Cloud Computing: A Practical Approach,* Mc Graw hill, New Delhi, India.
2. Michael Miller (2008), *Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online*, Que Publishing.

REFERENCE BOOKS:
1. Haley Beard (2008), *Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing*, Applications and Data Centers in the Cloud with SLAs, 2nd edition, Emereo Pty Limited, USA.
2. Tim Mather, Subra Kumaraswamy, Shahed Latif (2009), *Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)*, 3rd edition, O'Reilly Media, Inc, India.

VARDHAMAN COLLEGE OF ENGINEERING
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SOFTWARE QUALITY ASSURANCE AND TESTING
(Professional Elective - III)

Course Code: **B1505**

L	P	C
3	-	3

UNIT - I

FUNDAMENTALS OF SOFTWARE QUALITY ASSURANCE: Ethical basis for software quality, total quality management principles, software processes and methodologies.

UNIT - II

QUALITY STANDARDS: Quality standards, practices and conventions, software configuration management, reviews and audits, enterprise resource planning software.

UNIT - III

QUALITY METRIC SYSTEM: Measurement theory, software quality metrics, designing software measurement programs, complexity metrics and models.

UNIT - IV

ORGANIZATIONAL LEARNING: Improving quality with methodologies, structured/information engineering.

UNIT - V

SOFTWARE TESTING: Introduction testing as an engineering activity, role of process in software quality, testing as a process, basic definitions, software testing principles, the tester's role in a software development organization, origins of defects.

UNIT - VI

DEFECT CLASSES: The defect repository and test design, defect examples, developer/tester support for developing a defect repository.

UNIT - VII

TESTING ISSUES: Introduction to testing design strategies, the smarter tester, test case design strategies, using black box approach to test case design, random testing, equivalence class partitioning, boundary value analysis, other black box.

UNIT - VIII

TEST DESIGN APPROACHES: Black box testing and cots using white box approach to test design, test adequacy criteria, coverage and control flow graphs, covering code logic paths, white box based test design, additional white box test design approaches, evaluating test adequacy criteria.

TEXT BOOKS:

1. Schulmeyer, G. Gordon, James McManus (1992), *Handbook of Software Quality Assurance*, 2nd Edition, Artech House Inc., Norwood, MA.
2. Ilene Burnstein (2003), *Practical Software Testing*, Springer Profissional Computing, Springer, NY, USA.

REFERENCE BOOKS:

1. Edward Kit (2008), *Software Testing in the Real World – Improving the Process*, 3rd Edition, Pearson Education, , New Delhi, India.
2. William E. Perry (2006), Effective methods for software testing, 3rd Edition, Wiley Publication Inc, Indianapolis, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING
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II SEMESTER

SERVICE ORIENTED ARCHITECTURE
(Professional Elective - III)

Course Code: **B1506**

	L	P	C
	3	-	3

UNIT - I

SOA AND WEB SERVICES FUNDAMENTALS: Introducing SOA, fundamental SOA, common characteristics of contemporary SOA, common tangible benefits of SOA, the roots of SOA, web services and primitive SOA, the web services frame work, services, service descriptions, messaging.

UNIT - II

SOA AND WS: * EXTENSIONS:

WEB SERVICES AND CONTEMPORARY SOA (PART-I: ACTIVITY MANAGEMENT AND COMPOSITION): Message exchange patterns, service activity coordination, atomic transactions, business activities, orchestration, choreography.

UNIT - III

WEB SERVICES AND CONTEMPORARY SOA (PART-II: ADVANCED MESSAGING, METADATA, AND SECURITY): Addressing, reliable messaging, correlation, policies, metadata exchange, security, notification and eventing.

UNIT - IV

SOA AND SERVICES ORIENTATION: Principles of Service Orientation - service Orientation and the enterprise, anatomy of SOA, common principles of service orientation, interrelation between principles of service orientation.

SERVICE LAYERS: Service orientation and object orientation, native web services support for principles of service orientation, service layers, business service layer, orchestration service layer, agnostics servies, service layer configuration scenarios.

UNIT - V

BUILDING SOA (PLANNING AND ANALYSIS): SOA delivery strategies, SOA delivery lifecycle phases, the top down strategy, the bottom up strategy, the agile strategy service.

ORIENTED ANALYSIS (PART-I: INTRODUCTION): Introduction to service oriented analysis. Benefits of a business centric SOA, deriving business services.

UNIT - VI

SERVICE ORIENTED ANALYSIS (PART-II: SERVICE MODELLING): Service modeling, service modeling guidelines, classifying service model logic, contrasting service modeling approaches.

UNIT - VII

BUILDING SOA (TECHNOLOGY AND DESIGN):

SERVICE ORIENTED DESIGN (PART-I: INTRODUCTION): Introduction to service oriented design, WSDL related XML schema language basics, WSDL language basics, service interface design tools.

SERVICE ORIENTED DESIGN (PART-II: SOA COMPOSITION GUIDELINES): SOA composing steps, considerations for choosing service layers, considerations for positioning core SOA standards, considerations for choosing SOA extensions.

UNIT - VIII

SERVICE ORIENTED DESIGN (PART-III: SERVICE DESIGN): Service design overview, service design guidelines.

SERVICE ORIENTED DESIGN (PART-IV: BUSINESS PROCESS DESIGN): WS: BPEL Extensions, WS coordination overview, service oriented business process design. Fundamental WS: * extensions, WS addressing language basics, WS reliable messaging language basics, WS policy language basics, WS metadata exchange language basics, WS security language basics, SOA platforms, SOA platform basics, SOA support in J2EE and .NET, integration considerations.

TEXT BOOKS:

1. Norbert Bieberstein, Sanjay Bose, Marc Fiammante, Keith Jones, Rawn Shah (2005), *Service Oriented Architecture Compass - Business Value, Planning, and Enterprise Roadmap*, IBM Press, India.
2. James P Lawler, H. Howell Barber (2008), *Service Oriented Architecture: SOA Strategy, Methodology and Technology*, Auerbach Publications, Taylor & Francis Group, (C), New York, USA.

REFERENCE BOOKS:

1. Thomas Erl (2005), *Service – Oriented Architecture – Concepts, Technology and Design*, 1st Edition, PHI.
2. Eric Newcomes, Greg Lomow (2008), *Understanding SOA with Web Services*, 1st Edition, Pearson Education, New Delhi, India.
3. A. Jeff Davies (2007), *The Definitive guide to SOA,* Dreamtech publications, India.
4. J. Mc Govern (2008), *Java Web Services Architecure,* Morgan Kaufmann Publishers, Elsevier, USA.
5. Shankar. K (2009), *SOA for Enterprise Applications*, Wiley India Edition.

VARDHAMAN COLLEGE OF ENGINEERING
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DATA WAREHOUSING AND DATA MINING
(Professional Elective - IV)

Course Code: **B1218**

L	P	C
3	-	3

UNIT - I
INTRODUCTION: Data mining, kinds of data, data mining functionalities, classification of data mining systems, data mining primitives, major issues in data mining.

UNIT - II
DATA PREPROCESSING: Descriptive data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation.

UNIT - III
DATA WAREHOUSE AND OLAP TECHNOLOGY: What is data warehouse, a multidimensional data model, data warehouse architecture, data warehouse implementation, from data warehouse to data mining.

UNIT - IV
MINING FREQUENT PATTERNS AND ASSOCIATIONS: Basic concepts, efficient and scalable frequent itemset mining methods, mining various kinds of association rules.

UNIT - V
CLASSIFICATION AND PREDICTION: Issues regarding classification and prediction, classification by decision tree induction, bayesian classification, rule based classification, prediction, accuracy and error measures.

UNIT - VI
CLUSTER ANALYSIS: Types of data in cluster analysis, a categorization of major clustering methods, partitioning methods, hierarchical methods, density based methods, grid based methods, model based clustering methods, clustering high dimensional data, outlier analysis.

UNIT - VII
MINING STREAM, TIME SERIES AND SEQUENCE DATA: Mining data streams, mining time series data, mining sequence patterns in biological data.

UNIT - VIII
MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA: Multidimensional analysis and descriptive mining of complex data objects, spatial data mining, multimedia data mining, text mining, mining the world wide web.

TEXT BOOKS:
1. Jiawei Han, Micheline Kamber, Jian Pei (2011), *Data Mining Concepts and Techniques*, 3rd edition, Elsevier, India.

REFERENCE BOOKS:
1. Margaret H Dunham (2006), *Data Mining Introductory and Advanced Topics*, 2nd edition, Pearson Education, India.
2. Amitesh Sinha (2007), *Data Warehousing*, Thomson Learning.
3. Arun K Pujari (2004), *Data Mining Techniques*, University Press (India) Private Limited, India.
4. W. H. Inmon (2005)*, Building the Data Warehouse*, Wiley Dreamtech India Pvt. Ltd, India.

VARDHAMAN COLLEGE OF ENGINEERING
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II SEMESTER

MODERN COMPILERS - THEORY AND PRACTICE
(Professional Elective - IV)

Course Code: **B1219**

	L	P	C
	3	-	3

UNIT - I
OVERVIEW OF COMPILATION: Phases of compilation, lexical analysis, regular grammar and regular expression for common programming language features, pass and phases of translation, interpretation, bootstrapping, data structures in compilation, LEX lexical analyzer generator.

UNIT - II
PARSING: Context free grammars, top down parsing - backtracking, LL (1), recursive descent parsing, predictive parsing, preprocessing steps required for predictive parsing.

UNIT - III
BOTTOM UP PARSING: Shift reduce parsing, LR and LALR parsing, error recovery in parsing, handling ambiguous grammar, YACC - automatic parser generator.

UNIT - IV
SYNTAX DIRECTED TRANSLATION: Syntax directed definition, construction of syntax trees, S-attributed and L-attributed definitions, translation schemes.

INTERMEDIATE CODE GENERATION: Intermediate forms of source programs, abstract syntax tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three address code, translation of simple statements, boolean expressions and flow of control statements.

UNIT - V
TYPE CHECKING: Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker, equivalence of type expressions, type conversions, overloading of functions and operators.

RUN TIME ENVIRONMENTS: Source language issues, storage organization, storage allocation strategies, access to nonlocal names, parameter passing, symbol tables, language facilities for dynamic storage allocation.

UNIT - VI
CODE OPTIMIZATION: Consideration for optimization, machine dependent and machine independent code optimization, scope of optimization, local optimization, frequency reduction, folding, DAG representation.

UNIT - VII
CODE GENERATOR: Processing the intermediate code, interpretation, code generation, simple code generation, code generation for basic blocks, BURS code generation and dynamic programming, register allocation by graph coloring, evaluation of code generation techniques preprocessing the intermediate code, post processing the target code, machine code generation.

UNIT - VIII
DATA FLOW ANALYSIS: Dataflow analysis, intermediate representation for flow analysis, various dataflow analyses. Transformations using dataflow analysis speeding up dataflow analysis, alias analysis.

LOOP OPTIMIZATION: Dominators, loop invariant computations, induction variables, array bounds checks, loop unrolling.

TEXT BOOKS:
1.   A. V. Aho, Ravi Sethi, J. D. Ullman(2008), *Compilers principles, techniques and tools* , 2nd edition, Pearson Education, India.
2.   Kenneth C. Louden (1997), Compiler Construction Principles and Practice, 1st edition, Course Technology, India.

REFERENCE BOOKS:
1.   Dick Grune, Henry E. Bal, Cariel J. H. Jacobs, Koen G. Langendoen(2003), *Modern compiler design,* wiley Dreamtech, India.
2.   Keith D. Cooper, Linda Torczon (2003), *Engineering a Compiler,* Elsevier, USA.
3.   K. L. P Mishra, N. Chandrashekaran (2003), *Theory of computer science Automata Languages and computation*, 2nd edition, Prentice Hall of India.

VARDHAMAN COLLEGE OF ENGINEERING
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II SEMESTER

DISTRIBUTED COMPUTING
(Professional Elective - IV)

Course Code: **B1220**

	L	P	C
	3	-	3

UNIT - I
INTRODUCTION: The different forms of computing, monolithic, distributed, parallel and cooperative computing, the meaning of distributed computing, examples of distributed systems, the strengths and weaknesses of distributed computing, operating system concepts relevant to distributed computing, the architecture of distributed applications.

UNIT - II
DISTRIBUTED COMPUTING PARADIGMS: Paradigms for distributed applications, message passing paradigm, the client-server paradigm (java socket API), the peer-to-peer paradigm

MESSAGE SYSTEM (MOM) PARADIGM: The point-to-point message model and the publish/subscribe message model, RPC model.

UNIT - III
THE DISTRIBUTED OBJECTS PARADIGMS: RMI, ORB, the object space paradigm, the mobile agent paradigm, the network services paradigm, the collaborative application (groupware paradigm), choosing a paradigm for an application.

UNIT - IV
DISTRIBUTED OBJECTS PARADIGM (RMI): Message passing versus distributed objects, an archetypal distributed object architecture, distributed object systems, RPC, RMI, the java RMI architecture, java RMI API, a sample RMI application, steps for building an RMI application, testing and debugging, comparison of RMI and socket API.

UNIT - V
DISTRIBUTED OBJECT PARADIGM(CORBA): The basic architecture, the CORBA object interface, inter-ORB protocols, object servers and object clients, CORBA object references, CORBA naming service and the interoperable naming service, CORBA object services, object adapters, java IDL, an example CORBA application.

UNIT - VI
DISTRIBUTED DOCUMENT BASED SYSTEMS: WWW, lotus notes, comparison of WWW and lotus notes.

DISTRIBUTED COORDINATION BASED SYSTEMS: Introduction to coordination models, TIB, JINI, comparison of TIB and JINI, software agents, agent technology, mobile agents.

DISTRIBUTED MULTIMEDIA SYSTEMS: Characteristics of multimedia data, QOS of service management, resource management, stream adaptation.

UNIT - VII
GRID COMPUTING: Definition of grid, grid types, computational grid, data grid, grid benefits and applications, drawbacks of grid computing, grid components, grid architecture and its relation to various distributed technologies.

UNIT - VIII
CLUSTER COMPUTING: Parallel computing overview, cluster computing – introduction, cluster architecture, parallel programming models and paradigms, applications of clusters.

TEXT BOOKS:
1. M. L. Liu (2004), *Distributed Computing Principles and Applications*, 1st Edition, Pearson Education, India.
2. R. Orfali, Dan Harkey, Jeri Edwards (1999), *Client/Server Programming with Java and CORBA*, 3rd Edition, John Wiley, New York, USA.

REFERENCE BOOKS:
1. J. Joseph, C. Fellenstein (2009), *Grid Computing*, 5th Edition, Pearson education, India.
2. Rajkumar Buyya (2008), *High Performance Cluster Computing*, 2nd Edition, Pearson education.
3. D. Minoli (2005), *A Networking Approach to Grid Computing*, 1st Edition, Wiley & sons, New Jersy, USA.
4. A. Abbas (2004), *Grid Computing: A Practical Guide to Technology and Applications*, 1st Edition, Firewall Media, India.
5. G. Coulouris, J. Dollimore and Tim Kindbirg (2005), *Distributed Systems Concepts and Design*, 4th Edition, Wiley & sons, New Jersy, USA.

VARDHAMAN COLLEGE OF ENGINEERING
(Autonomous)

II SEMESTER

DATABASE MANAGEMENT SYSTEMS AND CASE TOOLS LAB

Course Code: **B1221**

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	-	3	2

I. DATABASE MANAGEMENT SYSTEMS LAB

DESCRIPTION OF SALES DATABASE
ABC is a company operating in the country with a chain of shopping centers in various cities. Everyday large numbers of items are sold in different shopping centers. The Sales database comprises of various tables like CUST, PROD, SALES_DETAIL, STATE_NAME with the following schemas.

CUST TABLE

Name	Type	Remark
CID	VARCHAR2(6)	PRIMARY KEY
CNAME	VARCHAR2(10)	
CCITY	VARCHAR2(8)	

PROD TABLE

Name	Type	Remark
PID	VARCHAR2(6)	PRIMARY KEY
PNAME	VARCHAR2(6)	
PCOST	NUMBER(4,2)	
PPROFIT	NUMBER(3)	

SALES_DETAIL

Name	Type	Remark
CID	VARCHAR2(6)	COMPOSITE PRIMARY KEY
PID	VARCHAR2(6)	COMPOSITE PRIMARY KEY
SALE	NUMBER(3)	
SALEDT	DATE	COMPOSITE PRIMARY KEY

STATE_NAME

Name	Type	Remark
CCITY	VARCHAR2(8)	PRIMARY KEY
STATE	VARCHAR2(15)	

1. DATA RETRIEVAL
a) Write a query to display all columns of CUST table.
b) Write a query to display pname of all records. Sort all records by pname. (use order by clause)
c) Write a query to display cname and ccity of all records. Sort by ccity in descending order.
d) Write a query to display cname, ccity who lives in mysore.
e) Write a query to display cname, pname, sale, saledt for all customers.
f) Write a query to display cname who have purchased Pen.
g) Write a query to display saledt and total sale on the date labeled as sale of all items sold after 01-sep-2010.
h) Write a query to display saledt and total sale on the date labeled as sale of all items other than DVD.
i) Write a query to display cname and ccity of all customers who live in Kolkata or Chennai.

2. USE OF DISTINCT, BETWEEN, IN CLAUSE, LIKE OPERATOR, DUAL
a) Write a query to display the pname and pcost of all the customers where pcost lies between 5 and 25.
b) Find the product ids in sale_detail table(eliminating duplicates).
c) Write a query to display distinct customer id where product id is p3 or sale date is '18-mar-2011'.
d) Write a query to display cname, pid and saledt of those customers whose cid is in c1 or c2 or c4 or c5.
e) Write a query to display cname, pid, saledt of those customers whose pid is p3 or sale date is '20-dec-2009'.
f) Write a query to display system date.
g) Write a query to display all records of prod table in which first and third character of pname is any character and second character is 'E'.
h) Write a query to display all cname which includes two 'A' in the name.

3. CONSTRAINTS
   a) Implement table level and Column level constraints like NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, CHECK.

4. SINGLE ROW FUNCTIONS: DATE FUNCTION
   a) Write a query to display the system date by rounding it to next month.
   b) Write a query to display the system date by rounding it to next year.
   c) Write a query to display the last date of the system date.
   d) Write a query to display the next date of system date which is Friday.
   e) Write a query to display sale date and date after 02 months from sale date.
   f) Write a query to display system date, sale date and months between two dates.
   g) Write a query to display the greatest date between sale date and system date, name it as BIG, also display sale date and SYSDATE.
   h) Write a query to display the least date between sale date and system date name it as SMALL, also display sale date and SYSDATE.

5. SINGLE ROW FUNCTIONS: NUMERIC AND CHARACTER FUNCTION
   a) Write a query to display the product name along with the rounded value of product cost for product name is "Pencil".
   b) Write a query to display product cost along with MOD value if divided by 5.
   c) Write a query to display cname in uppercase, lowercase, titlecase from cust table where customer name is "rohan".
   d) Write a query to display all concatenated value of cname, ccity by converting cname into titlecase and ccity into uppercase.
   e) Write a query to display the first 3 characters of cname.
   f) Write a query to display the position of 'M' in the cname of the customer whose name is "SAMHITA".
   g) Write a query to display the length of all customer names.
   h) PAD # character in left of product cost to a total width of 5 character position.

6. GROUP FUNCTIONS AND SET FUNCTIONS
   a) Write a query to display the total count of customer.
   b) Write a query to display the minimum cost of product.
   c) Write a query to display average value of product cost rounded to 2nd decimal places.
   d) Write a query to display product name with total sale detail in descending order.
   e) Write a query to display product name, sale date and total amount collected for the product.
   f) Write a query to display sale date and total sale date wise which was sold after "14-jul-08".
   g) Write a query to display the customer name who belongs to those places whose name is having I or P.
   h) Write a query to display customer name who belongs to a city whose name contains characters 'C' and whose name contains character 'A'.
   i) Write a query to display the customer name who does not belong to PUNE.

7. PL/SQL
   a) Write a PL/SQL program to find largest number among three. (Hint: Use Conditional Statement)
   b) Write a PL/SQL program to display the sum of numbers from 1 to N using for loop, loop…end and while…loop.

8. TRIGGERS
   a) Develop a PL/SQL program using BEFORE and AFTER triggers.

9. CURSORS
   a) Declare a cursor that defines a result set. Open the cursor to establish the result set. Fetch the data into local variables as needed from the cursor, one row at a time. Close the cursor when done.

II. CASE TOOLS LAB

CASE STUDY 1: LIBRARY INFORMATION SYSTEM

Problem Statement:
A library lends books and magazines to members, who are registered in the system. Also it handles the purchase of new titles for the library. Popular titles are bought in multiple copies. A member can reserve a book or magazine that is not currently available in the library, so that when it is returned by the library that person is notified. The library can easily create, update and delete information about the titles, members, loans and reservations in the systems.

CASE STUDY 2: AUTOMATED TELLER MACHINE (ATM)

Problem Statement:
Software is designed for supporting a computerized ATM banking network. All the process involved in the bank is computerized these days. All the accounts maintained in the bank and also the transactions effected, including ATM transactions are to be processed by the computers in the bank. An ATM accepts a relevant cash card, interacts with user, communicates with the central system to carry out the transaction, dispenses cash, and prints receipts. The system to be designed and implemented must include appropriate record keeping and security provisions. The system must handle concurrent access to the same account.

CASE STUDY 3: ONLINE TICKET RESERVATION FOR RAILWAYS

Problem Statement:
Computer play an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description.

CASE STUDY 4: RECRUITMENT PROCEDURE FOR SOFTWARE INDUSTRY

Problem Statement:
In the software industry the recruitment procedure is the basic thing that goes in the hand with the requirement as specified by the technical management team. HR first gives an advertisement in leading Newspapers, Journals, Weeklies and Websites. The job seekers can apply for it through by Post or by e-mail to the company.
The technical skill and the experience of the candidates are reviewed and the short listed candidates are called for the interview.
There may be different rounds for interview like the written test, technical interview, HR interview. After the successful completion of all rounds of interview, the selected candidates names are displayed. Mean while HR gives all the details about the salary, working hours, terms and conditions and the retirement benefit to the candidate.

M. Tech. CSE I / II SEMESTER

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TECHNICAL SEMINAR

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1.   OBJECTIVE:

Seminar is an important component of learning in an Engineering College, where the student gets acquainted with preparing a report & presentation on a topic.

2.   **PERIODICITY / FREQUENCY OF EVALUATION: Twice**

3.   PARAMETERS OF EVALUATION:

1.   The seminar shall have two components, one chosen by the student from the course-work without repetition and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work.

2.   The two components of the seminar are distributed between two halves of the semester and are evaluated for 50 marks each. The average of the two components shall be taken as the final score.

3.   The students shall be required to submit the rough drafts of the seminar outputs within one week of the commencement of the class work.

4.   Supervisor shall make suggestions for modification in the rough draft. The final draft shall be presented by the student within a week thereafter.

5.   Presentation schedules will be prepared by different Departments in line with the academic calendar.

The Seminars shall be evaluated in two stages as follows:

A.   Rough draft

In this stage, the student should collect information from various sources on the topic and collate them in a systematic manner. He/ She may take the help of the concerned supervisor.

The report should be typed in "MS-Word" file with "calibri" font, with font size of 16 for main heading, 14 for sub-headings and 11 for the body text. The contents should also be arranged in Power Point Presentation with relevant diagrams, pictures and illustrations. It should normally contain 18 to 25 slides, consisting of the followings:

1.	Topic, name of the student & guide	1 Slide
2.	List of contents	1 Slide
3.	Introduction	1 - 2 Slides
4.	Descriptions of the topic (point-wise)	7 - 10 Slides
5.	Images, circuits etc.	6 - 8 Slides
6.	Conclusion	1 - 2 Slides
7.	References/Bibliography	1 Slide

The soft copy of the rough draft of the seminar presentation in MS Power Point format along with the draft Report should be submitted to the concerned supervisor, with a copy to the concerned HOD within 30 days of the commencement of class work.

The evaluation of the Rough draft shall generally be based upon the following.

1.	Punctuality in submission of rough draft and discussion	2 Marks
2.	Resources from which the seminar have been based	2 Marks
3.	Report	3 Marks
4.	Lay out, and content of Presentation	3 Marks
5.	Depth of the students knowledge in the subject	5 Marks
Total		15 Marks

After evaluation of the first draft the supervisor shall suggest further reading, additional work and fine tuning, to improve the quality of the seminar work.

Within 7 days of the submission of the rough draft, the students are to submit the final draft incorporating the suggestions made by the supervisor.

B.   Presentation:

After finalization of the final draft, the students shall be allotted dates for presentation (in the designated seminar classes) and they shall then present it in presence students, supervisor, faculties of the department and at least one faculty from some department / other department.

The student shall submit 3 copies of the Report neatly bound along with 2 soft copies of the PPT in DVD medium. The students shall also distribute the title and abstract of the seminar in hard copy to the audience. The final presentation has to be delivered with 18-25 slides.

The evaluation of the Presentation shall generally be based upon the following.

1.	Contents	10 Marks
2.	Delivery	10 Marks
3.	Relevance and interest the topic creates	5 Marks
4.	Ability to involve the spectators	5 Marks
5.	Question answer session	5 Marks
Total		35 Marks

4.   **WHO WILL EVALUATE?**

The presentation of the seminar topics shall be made before an internal evaluation committee comprising the Head of the Department or his/her nominee, seminar supervisor and a senior faculty of the department / other department.

M. Tech. CSE III SEMESTER

COMPREHENSIVE VIVA

Course Code: **B1223**

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1.   **OBJECTIVE:**

- To enable the examiners to assess the candidate's knowledge in his or her particular field of learning.

- To test the student's awareness of the latest developments and relate them to the knowledge acquired during the classroom teaching.

2.   **PARAMETERS OF EVALUATION:**

Subject Knowledge	Current Awareness	Career Orientation	Communication Skills	Total
20	10	10	10	50

3.   **WHO WILL EVALUATE?**

The comprehensive Viva will be conducted by a committee comprising Head of the Department or his/her nominee, two senior faculty of the respective department and an external examiner from outside the college. The comprehensive viva shall be evaluated for 50 marks at the end of III semester. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

4.   **PERIODICITY / FREQUENCY OF EVALUATION:**   **Once**

5.   **PEDAGOGY:**

- The viva will be held on a face to face basis.

- The students will be expected to answer the questions related to latest developments and all courses taken till date.

- Viva voce will be conducted within week before the beginning of midterm examinations. However, in exceptional circumstances it can be scheduled immediately after the end of midterm examinations.

- Students will have to make themselves available on the date of the viva voce.

M. Tech. CSE III/ IV SEMESTER

PROJECT WORK

1.   OBJECTIVE:

The main objective of the Project Work is for the students to learn and experience all the major phases and processes involved in solving "real life engineering problems".

2.   EXPECTED OUTCOME:

The major outcome of the M. Tech project must be well-trained students. More specifically students must have acquired:

•   System integration skills
•   Documentation skills
•   Project management skills
•   Problem solving skills

3.   PROJECT SELECTION:

Projects are suggested by the faculty, with or without collaboration with an industry. All faculty are to suggest projects. Students are also encouraged to give project proposals after identifying a faculty who would be willing to supervisor the work. A Project brief is to be given by the faculty to the group defining the project comprehensively.

All M. Tech major projects are to be done in the Institute. For industry specified projects, students will be permitted to spend 1-2 weeks in the industry on recommendation by the supervisor. The number of students per batch should be 1.

4.   WHO WILL EVALUATE?

The end semester examination shall be based on the report submitted and a viva-voce exam for 100 marks by committee comprising of the Head of the Department, project supervisor and an external examiner.

5.   EVALUATION:

The basic purpose is to assess the student competencies with regard to his project work. More specifically to assess the student's individual contribution to the project, to establish the level of understanding of basic theoretical knowledge relevant to the project and to ensure that the student has good understanding and appreciation of design and development decisions taken in the course of the project. It is desirable that all faculty members are present for the evaluations as this is a platform to get to know the student projects and to motivate the students to do good projects. The faculty should adopt a clear and consistent pattern of asking questions from general to specific aspects of the project. The presentation and evaluation is open to other students of the department.

The project work shall be evaluated for 150 marks out of which 50 marks for internal evaluation and 100 marks for end-semester evaluation. The evaluation shall be done on the following basis

Semester III	Semester IV
Preliminary Evaluation - 50 marks	Design Evaluation I - 25 marks
	Design Evaluation II - 25 marks
	Final Evaluation – 100 marks

6.   GUIDELINES FOR THE PREPARATION OF M. TECH PROJECT REPORTS

1.1.   Project reports should be typed neatly only on one side of the paper with 1.5 or double line spacing on a A4 size bond paper (210 x 297 mm). The margins should be: Left - 1.25", Right - 1", Top and Bottom - 0.75".

1.2.   The total number of reports to be prepared are:

•   One copy to the department

- One copy to the concerned guide(s)
- One copy to the candidate.

1.3. Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.

1.4. For making copies dry tone Xerox is suggested.

1.5. Every copy of the report must contain
- Inner title page (White)
- Outer title page with a plastic cover
- Certificate in the format enclosed both from the college and the organization where the project is carried out.
- An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

6.6. The organization of the report should be as follows:

1. Inner title page 2. Abstract or Synopsis 3. Acknowledgments 4. Table of Contents 5. List of table & figures (optional)	Usually numbered in roman

6.7 Chapters (to be numbered) containing Introduction, which usually specifies the scope of work and its importance and relation to previous work and the present developments, Main body of the report divided appropriately into chapters, sections and subsections.
- The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.
- The report should be typed in "MS-Word" file with "calibri" font. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 11.
- The figures and tables must be numbered chapter wise for e.g.: Fig. 2.1 Block diagram of a serial binary adder, Table 3.1 Primitive flow table, etc.
- The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

6.8. **Reference OR Bibliography:** The references should be **numbered serially** in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.
1. For textbooks - A.V. Oppenheim and R.W. Schafer, Digital Signal Processing, Englewood, N.J., Prentice Hall, 3 Edition, 1975.
2. For papers - Devid, Insulation design to combat pollution problem, Proc of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.

6.9. Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g. **V = IZ** .... **(3.2)**

6.10. All equation numbers should be right justified.

6.11. The project report should be brief and include descriptions of work carried out by others only to the minimum extent necessary. Verbatim reproduction of material available elsewhere should be strictly avoided. Where short excerpts from published work are desired to be included, they should be within quotation marks appropriately referenced.

6.12. Proper attention is to be paid not only to the technical contents but also to the organization of the report and clarity of the expression. Due care should be taken to avoid spelling and typing errors. The student should note that report-write-up forms the important component in the overall evaluation of the project

6.13. Hardware projects must include: the component layout, complete circuit with the component list containing the name of the component, numbers used, etc. and the main component data sheets as Appendix. At the time of report submissions, the students must hand over a copy of these details to the project coordinator and see that they are entered in proper registers maintained in the department.

6.14. Software projects must include a virus free disc, containing the software developed by them along with the read me file. Read me file should contain the details of the variables used, salient features of the software and procedure of using them: compiling procedure, details of the computer hardware/software requirements to run the same, etc. If the developed software uses any public domain software downloaded from some site, then the address of the site along with the module name etc. must be included on a separate sheet. It must be properly acknowledged in the acknowledgments.

6.15. Sponsored Projects must also satisfy the above requirements along with statement of accounts, bills for the same dully attested by the concerned guides to process further, They must also produce NOC from the concerned guide before taking the internal viva examination.

6.16. The reports submitted to the department/guide(s) must be hard bounded, with a plastic covering.

6.17. Separator sheets, used if any, between chapters, should be of thin paper

VARDHAMAN COLLEGE OF ENGINEERING
(Autonomous)
Shamshabad – 501 218, Hyderabad

Department of …………………………………………………..

CERTIFICATE

Certified that the project work entitled …………………………………………….. carried out by Mr./Ms. ……………………………………….., Roll Number …………………………, a bonafide student of ……………………………………in partial fulfillment for the award of **Master of Technology** in …………………………………………………………… of the Jawaharlal Nehru Technological University, Hyderabad during the year …………………….. It is certified that all corrections / suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Name & Signature of the Guide   **Name Signature of the HOD**   **Signature of the Principal**

External Viva

Name of the examiners   Signature with date
1.
2.

Certificate issued at the Organization where the project was carried out

(On a separate sheet, If applicable)

NAME OF THE INDUSTRY / ORGANIZATION, Address with pin code

CERTIFICATE

Certified that the project work entitled ……………………………………………………………………………….. carried out by Mr./Ms . …………………………………………., Roll Number……………….………, a bonafide student of …………………………………………………………………………….in partial fulfillment for the award of **Master of Technology** in ……………………………………..……………………………… of the Jawaharlal Nehru Technological University, Hyderabad during the year ……………………….. It is certified that, he/she has completed the project satisfactorily

Name & Signature of the Guide   **Name & Signature of the Head of Organization**

7.   **DISTRIBUTION OF MARKS FOR M.TECH DISSERTATION EVALUATION**

S No.	Particulars	Max. Marks
1	Relevance of the subject in the present context	**10**
2	Literature Survey	**10**
3	Problem formulation	**10**
4	Experimental observation / theoretical modeling	**10**
5	Results – Presentation & Discussion	**20**
6	Conclusions and scope for future work	**10**
7	Overall presentation of the Thesis / Oral presentation	**20**
8	Project Report Writing	**10**
Total Marks		**100**

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their

		seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
	any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. |
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Frequently asked Questions and Answers about autonomy

1. **Who grants Autonomy? UGC, Govt., AICTE or University**
    In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy.

2. **Shall VCE award its own Degrees?**
    No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name Vardhaman College of Engineering on the Degree Certificate.

3. **What is the difference between a Deemed University and an Autonomy College?**
    A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. **How will the Foreign Universities or other stake – holders know that we are an Autonomous College?**
    Autonomous status, once declared, shall be accepted by all the stake holders. Foreign Universities and Indian Industries will know our status through our college website.

5. **What is the change of Status for Students and Teachers if we become Autonomous?**
    An autonomous college carries a prestigious image. Autonomy is actually earned out of continued past efforts on academic performances, capability of self-governance and the kind of quality education we offer.

6. **Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?**
    There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee is a Non – Statutory body, which will keep a watch on the academics and keep its reports and recommendations every year. In addition to Academic Council, the highest academic body also supervises the academic matters. At the end of three years, there is an external inspection by the University for this purpose. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7. **Will the students of VCE as an Autonomous College qualify for University Medals and Prizes for academic excellence?**
    No. VCE has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural and co-curricular organized by the University the students shall qualify.

8. **Can VCE have its own Convocation?**
    No, since the University awards the Degree the Convocation will be that of the University.

9. **Can VCE give a provisional degree certificate?**
    Since the examinations are conducted by VCE and the results are also declared by VCE, the college sends a list of successful candidates with their final percentage of marks to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10. **Will Academic Autonomy make a positive impact on the Placements or Employability?**
    Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment, besides the autonomous status is more responsive to the needs of the industry. As a result, there will be a lot of scope for

industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11. **What is the proportion of Internal and External Assessment as an Autonomous College?**
Presently, it is 25 % for internal assessment and 75 % for external assessment. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12. **Will there be any Revaluation or Re-Examination System?**
No. There will not be any Revaluation system or Re-examination. But, there is a personal verification of the answer scripts.

13. **How fast Syllabi can be and should be changed?**
Autonomy allows us the freedom to change the syllabi as often as we need.

14. **Will the Degree be awarded on the basis of only final year performance?**
No. The percentage of marks will reflect the average performance of all the semesters put together.

15. **Who takes Decisions on Academic matters?**
The Academic Council of College is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like the BOS which are like Boards of Studies of the University.

16. **What is the role of Examination committee?**
The Exam Committee is responsible for the smooth conduct of inter and external examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Memorandum of Marks etc fall within the duties of the Examination Committee.

17. **Is there any mechanism for Grievance Redressal?**
Yes, the college has grievance redressal committee, headed by a senior faculty member of the college.

18. **How many attempts are permitted for obtaining a Degree?**
All such matters are defined in Rules & Regulations.

19. **Who declares the result?**
The result declaration process is also defined. After tabulation work the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the College Academic Council for its approval. The result is then declared on the college notice boards as well put on the web site of the college. It is eventually sent to the University.

20. **What is our relationship with the Jawaharlal Nehru Technological University, Hyderabad?**
We remain an affiliated college of the Jawaharlal Nehru Technological University, Hyderabad. The University has the right to nominate its members on the academic bodies of the college.

21. **Shall we require University approval if we want to start any New Courses?**
Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

22. **Shall we get autonomy for PG and Doctoral Programmes also?**
Yes, presently our PG programmes are also enjoying autonomous status.

23. **How many exams will be there as an autonomous college?**
This is defined in the Rules & Regulations.