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
WIRELESS AND MOBILE COMMUNICATIONS

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI FOR M.TECH – WIRELESS AND MOBILE COMMUNICATIONS 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 - WIRELESS AND MOBILE COMMUNICATIONS

REGULATIONS: VCE--R11

I SEMESTER

Code	Subject	Periods per Week		Credits	Scheme of Examination Maximum Marks		
		L	P		Internal	External	Total
B1401	Advanced Data Communications	3	-	3	40	60	100
B1402	Advanced Digital Signal Processing	3	-	3	40	60	100
B1101	Telecommunication Switching Systems and Networks	3	-	3	40	60	100
B1102	Internetworking and Internet Protocols	3	-	3	40	60	100
PROFESSIONAL ELECTIVE - I		3	-	3	40	60	100
PROFESSIONAL ELECTIVE - II		3	-	3	40	60	100
B1108	Signal Processing Laboratory	-	3	2	40	60	100
B1109	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
B1110	Coding Theory and Techniques	3	-	3	40	60	100
B1111	Wireless Communications and Networks	3	-	3	40	60	100
B1112	Ad hoc Wireless and Sensor Networks	3	-	3	40	60	100
B1113	Spread Spectrum Communications	3	-	3	40	60	100
PROFESSIONAL ELECTIVE - III		3	-	3	40	60	100
PROFESSIONAL ELECTIVE - IV		3	-	3	40	60	100
B1118	Advanced Communications Laboratory	-	3	2	40	60	100
B1119	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
B1120	Comprehensive Viva	-	-	4	-	50	50
B1121	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
B1122	Project Work Phase – II	-	-	22	50	100	150
TOTAL		**-**	**-**	**22**	**50**	**100**	**150**

VARDHAMAN COLLEGE OF ENGINEERING
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SYLLABUS
M. TECH - WIRELESS AND MOBILE COMMUNICATIONS

REGULATIONS: VCE--R11

ELECTIVES			
PROFESSIONAL ELECTIVE - I		**PROFESSIONAL ELECTIVE - II**	
Code	**Subject**	**Code**	**Subject**
B1405	Detection & Estimation Theory	B1105	Optical Communication Technology
B1103	Mobile Satellite Communications	B1106	Mobile Computing Technologies
B1104	Speech Signal Processing	B1107	RF Circuit Design
PROFESSIONAL ELECTIVE - III		**PROFESSIONAL ELECTIVE - IV**	
Code	**Subject**	**Code**	**Subject**
B1413	Network Security and Cryptography	B1115	Optical Networks
B1414	Digital Signal Processors and Architectures	B1116	Software Defined Radio
B1114	Voice Over Internet Protocol	B1117	Propagation Models for Wireless Communications

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I SEMESTER

ADVANCED DATA COMMUNICATIONS

Course Code: **B1401**

L	P	C
3	-	3

UNIT - I

DIGITAL MODULATION - I: Introduction, information capacity bits, bit rate, baud, and M-ARY coding, ASK, FSK, PSK, QAM methods, band width efficiency, carrier recovery, clock recovery.

UNIT - II

DIGITAL MODULATION - II: QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK methods, band width efficiency, carrier recovery, clock recovery.

UNIT - III

BASIC CONCEPTS OF DATA COMMUNICATIONS, INTERFACES AND MODEMS - I: Data communication, components, networks, distributed processing, network criteria, applications, protocols and standards, standards organizations- regulatory agencies, line configuration- point-to-point and multipoint, topology- mesh, star, tree, bus, ring and hybrid topologies.

UNIT - IV

BASIC CONCEPTS OF DATA COMMUNICATIONS, INTERFACES AND MODEMS - II: transmission modes- simplex- half duplex- full duplex, categories of networks- LAN, MAN, WAN and internetworking, digital data transmission- parallel and serial, DTE- DCE Interface- data terminal equipment, data circuit- terminating equipment, standards EIA 232 interface, other interface standards, modems- transmission rates.

UNIT - V

MULTIPLEXING: Time division multiplexing, T1 digital carrier system, line encoding, T-carriers, frame synchronization, bit interleaving versus word inter leaving, statistical time division multiplexing, wavelength division multiplexing.

UNIT - VI

ERROR DETECTION AND CORRECTION: Types of errors, single bit error, CRC (Cyclic Redundancy Check) performance, checksum, error correction, single bit error correction, hamming code.

DATA LINK CONTROL: Stop and wait, sliding window protocols.

UNIT - VII

DATA LINK PROTOCOLS: Asynchronous protocols, synchronous protocols, character oriented protocol- binary synchronous communication (BSC) - BSC Frames- data transparency, bit oriented protocols – HDLC, link access protocols.

UNIT - VIII

SWITCHING: Circuit switching- space division switches- time division switches- TDM bus- space and time division switching combinations- public switched telephone network, packet switching- datagram approach- virtual circuit approach- circuit switched connection versus virtual circuit connection, message switching.

TEXT BOOKS:

1. B. A. Forouzan (2008), *Data Communication and Computer Networking,* 3rd edition, Tata McGraw Hill publications, New Delhi, India.
2. W. Tomasi (2008), *Advanced Electronic Communication Systems*, 5th edition, Prentice Hall of India, India.

REFERENCE BOOKS:

1. Prakash C. Gupta (2006), *Data Communications and Computer Networks*, Prentice Hall of India, India.
2. William Stallings (2007), *Data and Computer Communications*, 8th edition, Prentice Hall of India, India.
3. T. Housely (2008), *Data Communication and Tele Processing Systems,* 2nd edition, BS Publications, India.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

ADVANCED DIGITAL SIGNAL PROCESSING

Course Code: **B1402**

L	P	C
3	-	3

UNIT - I

DESIGN OF DIGITAL FILTERS: Implementation of discrete time systems - IIR and FIR filters.

UNIT - II

MULTIRATE SIGNAL PROCESSING: Introduction, decimation by a factor D, interpolation by a factor I, sampling rate conversion by a rational factor I/D, multistage implementation of sampling rate conversion, filter design & implementation for sampling rate conversion.

UNIT - III

APPLICATIONS OF MULTIRATE SIGNAL PROCESSING: Design of phase shifters, interfacing of digital system with different sampling rates, implementation of narrow band low pass filters, implementation of digital filter banks, sub band coding of speech signals, quadrature mirror filters, transmultiplexers, oversampling A/D and D/A conversion.

UNIT - IV

LINEAR PREDICTION: Forward and backward linear prediction, optimum reflection coefficients for the lattice forward and backward predictors, solution of the normal equations: Levinson Durbin algorithm, Schur algorithm, properties of linear prediction filters.

UNIT - V

NON-PARAMETRIC METHODS OF POWER SPECTRAL ESTIMATION: Estimation of spectra from finite duration observation of signals, non-parametric methods: Bartlett, Welch & Blackman & Tukey methods, comparison of all non-parametric methods.

UNIT - VI

PARAMETRIC METHODS OF POWER SPECTRUM ESTIMATION: Autocorrelation & its properties, relation between auto correlation and model parameters, AR models, Yule Waker and Burg methods, MA and ARMA models for power spectrum estimation.

UNIT - VII

WEINER FILTERS: Linear optimum filtering, principle of orthogonality, minimum mean-square error, Weiner Hopf equations, error performance surface, multiple linear regression model.

UNIT - VIII

KALMAN FILTERS: Statement of Kalman filter, the innovation process, estimation of the state using the innovation process, filtering, initial conditions, summary of Kalman filter.

TEXT BOOKS:

1. J. G. Proakis, D. G. Manolokis (1996), *Digital Signal Processing: Principles, Algorithms & Applications,* 4th edition, Prentice Hall of India, New Delhi.
2. Simon Haykin (2002), *Adaptive Filter Theory,* 4th edition, Pearson Education, New Delhi, India.

REFERENCE BOOKS:

1. S. M. Kay (1988*), Modern spectral Estimation: Theory & Application*, Prentice Hall of India, New Delhi.
2. P. P. Vaidyanathan (2008), *Multirate Systems and Filter Banks,* Pearson Education, New Delhi, India.

I SEMESTER

TELECOMMUNICATION SWITCHING SYSTEMS AND NETWORKS

Course Code: **B1101**

L	P	C
3	-	3

UNIT - I

INTRODUCTION: Evolution of telecommunications, simple telephone communication, basics of switching system, manual switching system, major telecommunication networks.

CROSSBAR SWITCHING: Principles of common control, touch tone dial telephone, principles of crossbar switching, crossbar switch configurations, cross point technology, crossbar exchange organization.

UNIT - II

ELECTRONIC SPACE DIVISION SWITCHING: Stored program control, centralized SPC, distributed SPC, software architecture, application software, enhanced services, two-stage networks, three stage networks, n-stage networks.

UNIT - III

TIME DIVISION SWITCHING: Basic time division space switching, basic time division time switching, time multiplexed space switching, time multiplexed time switching, combination switching, three-stage combination switching n-stage combination switching**.**

UNIT - IV

TELEPHONE NETWORKS: Subscriber loop system, switching hierarchy and routing, transmission plan, transmission systems, numbering plan, charging plan, signaling techniques, in-channel signaling, common channel signaling, cellular mobile telephony.

UNIT - V

SIGNALING: Customer line signaling, audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling inter-register signaling, common-channel signaling principles, CCITT signaling system no.6, CCITT signaling system no.7, digital customer line signaling.

UNIT - VI

PACKET SWITCHING: Statistical multiplexing, local-area and wide- area networks, large-scale networks, broadband networks.

SWITCHING NETWORKS: Single-state networks, grading, link systems, grades of service of link systems, application of graph theory to link systems, use of expansion, call packing, rearrangeable networks, strict-sense non-blocking networks, sectionalized switching networks.

UNIT - VII

TELECOMMUNICATIONS TRAFFIC: The unit of traffic, congestion, traffic measurements, a mathematical model, lost-call systems, queuing systems.

UNIT - VIII

INTEGRATED SERVICES DIGITAL NETWORK: Motivation for ISDN, new services, network and protocol architecture, transmission channels, user-network interfaces, signaling, numbering and addressing, service characterization, interworking, ISDN standards, expert systems in ISDN, broadband ISDN, voice data integration.

TEXT BOOKS:

1. Thyagarajan Viswanath (2000), *Tele communication switching system and networks*, Prentice Hall of India, New Delhi, India.
2. J. E. Flood (2006), *Telecommunication switching, Traffic and Networks*, Pearson Education, India.

REFERENCE BOOKS:

1. J. Bellamy (2001), *Digital telephony*, 2nd edition, John Wiley and Sons, India.
2. Achyut S. Godbole (2004), *Data Communications & Networks,* Tata McGraw Hill, India.
3. H. Taub, D. Schilling (2003), *Principles of Communication Systems*, 2nd Edition, Tata McGraw Hill, India.
4. B.A. Forouzan (2004), *Data Communications & Networking,* 3rd Edition, Tata McGraw Hill, India.
5. Roger L. Freeman (2004), *Telecommunication System Engineering*, 4th edition, Wiley-Inters, India.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

INTERNETWORKING AND INTERNET PROTOCOLS

Course Code: **B1102**

L	P	C
3	-	3

UNIT - I

INTERNETWORKING CONCEPTS: Principles of internetworking, connectionless internetworking, application level interconnections, network level interconnection , internet architecture, wired LANS, wireless LANs, point-to-point WANs, switched WANs, connecting devices, OSI model and the TCP/IP protocol suite.

UNIT - II

IP ADDRESSING: Classful addressing- introduction, classful addressing, other issues, sub-netting and super netting, Classless addressing- variable length blocks, sub-netting, address allocation, delivery, forwarding, routing and structure of IP router, ARP, ARP package, RARP.

UNIT - III

INTERNET PROTOCOL (IP): Datagram, fragmentation, options, checksum, IP V.6.

TRANSMISSION CONTROL PROTOCOL (TCP): TCP services, TCP features, segment, a TCP connection, state transition diagram, flow control, error control, congestion control, TCP timers.

UNIT - IV

STREAM CONTROL TRANSMISSION PROTOCOL (SCTP): SCTP services, SCTP features, packet format, flow control, error control, congestion control.

UNICAST ROUTING PROTOCOLS (RIP, OSPF, AND BGP): Intra and inter-domain routing, distance vector routing, RIP, link state routing, OSPF, path vector routing, BGP.

UNIT - V

MULTICASTING AND MULTICAST ROUTING PROTOCOLS: Unicast, multicast- broadcast, multicast applications, multicast routing, multicast link state routing: MOSPF, multicast distance vector: DVMRP, CBT, PIM, MBONE.

UNIT - VI

DNS, REMOTE LOGIN TELNET, FTP AND TFTP: DNS - Name space, domain name space, distribution of name space, and DNS in the internet, concepts of remote login telnet, network virtual terminal (NVT), file transfer protocol (FTP).

UNIT - VII

ELECTRONIC MAIL, WWW, MOBILE IP: SMTP, POP and IMAP, HTTP, addressing, agents, three phases, inefficiency in mobile IP

UNIT - VIII

MULTIMEDIA: Digitizing audio and video, audio and video compression, streaming stored audio/video, streaming live audio/video, real time interactive audio/video, RTP, RTCP, Voice over IP.

NETWORK SECURITY: Security in the internet, firewalls.

TEXT BOOKS:

1. Behrouz A. Forouzan (2008), *TCP/IP Protocol Suite*, 3rd Edition, Tata McGraw Hill, New Delhi.
2. Douglas Comer, David L. Stevens (2001), *Internetworking with TCP/IP*, 3rd Edition, Prentice Hall of India, New Delhi, India.

REFERENCE BOOKS:

1. Mahbub Hassan, Raj Jain (2005), *High performance TCP/IP Networking*, Prentice Hall of India, New Delhi.
2. B.A. Forouzan (2007), *Data Communications & Networking*, 2nd Edition, Tata McGraw Hill, New Delhi.
3. William Stallings (2002), *High Speed Networks and Internets*, Pearson Education, New Delhi, India.
4. William Stallings (2007), *Data and Computer Communications*, 7th Edition, Pearson Education, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

DETECTION AND ESTIMATION THEORY

(Professional Elective - I)

Course Code: **B1405**

L	P	C
3	-	3

UNIT - I

CLASSICAL DETECTION AND ESTIMATION THEORY: Introduction, simple binary hypothesis tests, M-hypothesis, estimation theory, composite hypothesis.

UNIT - II

REPRESENTATION OF RANDOM PROCESSES: Sampling of band limited random signals, periodic random processes, spectral decomposition, vector random processes.

UNIT - III

DETECTION AND ESTIMATION OF SIGNALS IN WHITE GAUSSIAN NOISE: Introduction, detection of signals in additive white gaussian noise, linear estimation, non linear esimation.

UNIT - IV

DETECTION AND ESTIMATION OF SIGNALS IN NON WHITE GAUSSIAN NOISE: Whitening approach, direct derivation using the Karhunen-Loeve expansion, a direct derivation with a sufficient statistic, detection performance, estimation, solution techniques for integral equations, sensitivity, known linear channels, multiple channels and multiple parameter estimation.

UNIT - V

DETECTION OF SIGNALS IN NOISE: Minimum probability error criterion, Neyman-Pearson criterion for radar, detection of variable amplitude signals: matched filters, optimum formulation, detection of random signals.

UNIT - VI

ESTIMATION OF CONTINUOUS WAVEFORMS: Derivation of estimator equations, a lower bound on the mean square estimation error, multi dimensional waveform estimation, nonrandom waveform estimation.

UNIT - VII

RECURSIVE LINEAR MEAN SQUARED ESTIMATION:

TIME VARYING SIGNALS AND KALMAN FILTERING: Introduction, estimation of a signal parameter, recursive estimation of time varying signals, Kalman filtering, filtering signals in noise treatment.

UNIT - VIII

LINEAR ESTIMATION: Realizable linear filters, Kalman Bucy filters, fundamental role of optimum linear filters.

TEXT BOOKS:

1. Harry L. Van Trees (2001), *Detection, Estimation and Modulation Theory*, John Wiley & Sons, USA.
2. Mischa Schwartz, Leonard Shaw (1975), *Signal Processing : Discrete Spectral Analysis ,Detection & Estimation*, Mcgrawhill, New Delhi.

REFERENCE BOOKS:

1. Steven. M. Kay (1998), *Fundamentals of Statistical Signal Processing*: Volume- I Estimation Theory, Prentice Hall, USA.
2. Srinath, Rajasekaran, Viswanathan (2003), *Introduction to Statistical Signal Processing with Applications*, Prentice Hall of India, New Delhi.
3. Louis L. Scharf (1991), *Statistical Signal Processing: Detection, Estimation and Time Series Analysis*, Addison Wesley.
4. K. Sam Shanmugam, Arthur M. Breiphol (1998), *Random Signals: Detection, Estimation and Data Analysis*, John Wiley & Sons.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

MOBILE SATELLITE COMMUNICATIONS

(Professional Elective - I)

Course Code: **B1103**

L	P	C
3	-	3

UNIT - I

INTRODUCTION: Evaluation of mobile telecommunications, satellite system architecture, regulatory considerations, operational considerations, mobile systems, a comparison, related satellite systems.

UNIT - II

SATELLITE ORBITS: Satellite coverage, space environment, eclipse on satellites, suns interface, Doppler Effect, orbital debris, summary of orbital characteristics.

UNIT - III

SATELLITE CONSTELLATIONS: Consideration in constellation design, polar constellations, inclined orbit constellations, hybrid constellations, regional coverage, use of spot beams, availability considerations for non geostationary satellites.

UNIT - IV

RADIO LINK: Spectrum sharing methods, spectrum forecast methodology, propagation characteristics, land mobile channel, aeronautical channel, radio link analysis.

UNIT - V

COMMUNICATORS: Gateways, mobile terminals antennas, hand held communicators, vehicle mounted terminals biological effects.

UNIT - VI

SPACECRAFT: Satellite for MSS – transponders, antenna systems, effect of orbital altitude on spacecraft design, inter satellite links, launching satellite constellations.

UNIT - VII

REPRESENTATIVE MSS SYSTEMS: Big LEO systems, little LEO systems, MEO systems, hybrid orbit systems.

UNIT - VIII

MOBILE SATELLITE NETWORKS: Operating environment, MSAT network concept, CDMA MSAT network, statistics of mobile propagation.

TEXT BOOKS:

1. M. Richharia, (2003), *Mobile Satellite Communications principles and trends*, Pearson education, New Delhi.
2. Tri T. Ha (1990), *Digital Satellite Communications*, McGraw Hill International Edition, USA.
3. Timothi Pratt, Charles Bostian and Jeremy Allnutt, (2003) *Satellite communications*, 2nd edition, Wiley publications, New Delhi.

REFERENCE BOOKS:

1. D. C Agarwal (1999), *Satellite Communications*, 5th edition, Khanna publication, New Delhi.
2. Gordan L. Stubber (2001), *Principle of Mobile Communication*, 2nd edition, Kluwer academic publishers, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

I SEMESTER

SPEECH SIGNAL PROCESSING

(Professional Elective - I)

Course Code: **B1104**

L	P	C
3	-	3

UNIT - I

CLASSIFICATION OF SPEECH SOUNDS: Review of signal processing, anatomy and physiology of speech production, spectrographic analysis of speech, categorization of speech sounds, prosody-the melody of speech, speech perception.

UNIT - II

ACOUSTICS OF SPEECH PRODUCTION: Introduction, physics of sound basics, the wave equation, uniform tube model-lossless case, effect of energy loss, boundary effects, a complete model, a discrete-time model based on tube concatenation.

UNIT - III

ANALYSIS AND SYNTHESIS OF POLE-ZERO SPEECH MODELS-I: Introduction, time-dependent processing, all-pole modeling of deterministic signals-formulation, error minimization, autocorrelation method, the levinson recursion and its associated properties, lattice filter formulation of the inverse filter, frequency-domain interpretation,linear prediction analysis of stochastic speech sounds formulation, error minimization, autocorrelation method.

UNIT - IV

ANALYSIS AND SYNTHESIS OF POLE-ZERO SPEECH MODELS-II: Criterion of goodness time domain frequency domain, synthesis based on all-pole modeling, pole-zero estimation linearization, application to speech, high-pitched speakers- using two analysis windows, decomposition of the glottal flow derivative model, estimation.

UNIT - V

HOMOMORPHIC SIGNAL PROCESSING: Introduction, homomorphic systems for convolution, complex cepstrum of speech-like sequences, sequences with rational z-transforms, impulse trains convolved with rational z-transform sequences, homomorphic filtering, discrete complex cepstrum, spectral root homomorphic filtering, short-time homomorphic analysis of periodic sequences, frequency-domain perspective, frequency-domain perspective.

UNIT - VI

SHORT TIME SPEECH ANALYSIS: Short time speech analysis-complex cepstrum of voiced speech, complex cepstrum of unvoiced speech, analysis/synthesis structures- zero and minimum-phase synthesis, mixed-phase synthesis, spectral root deconvolution contrasting linear prediction and homomorphic filtering-properties, homomorphic prediction.

UNIT - VII

SHORT-TIME FOURIER TRANSFORM ANALYSIS-I: Introduction, short-time analysis-Fourier transform view, filtering view, time-frequency resolution tradeoffs, short-time synthesis- formulation, filter bank summation (FBS) method, overlap-add (OLA) method, time-frequency sampling.

UNIT - VIII

SHORT-TIME FOURIER TRANSFORM ANALYSIS-II: Short-time Fourier transform magnitude-signal representation, reconstruction from time-frequency samples, signal estimation from the modified STET or STFTM-heuristic application of STFT synthesis methods,least-squared-error signal estimation from the modified STFT, LSE signal estimation from modified STFTM, time-scale modification and enhancement of speech-time-scale modification, noise reduction.

TEXT BOOKS:

1. Thomas F. Quatieri (2001), *Discrete-Time Speech Signal Processing: Principles and Practice*, 2nd edition, Dev Publishers & Distributors, New Delhi.
2. Ben Gold and Nelson Morgan (2006), *Speech and Audio Signal Processing: Processing and Perception of Speech and Music*, Wiley Publishers, New Delhi, India.

REFERENCE BOOKS:

1. Lawrence R. Rabiner, Ronald W. Schafer (1979), *Introduction to Digital Speech Processing*, Pearson Education, New Delhi, India.
2. Sadaoki Furui (2001), *Digital Speech Processing, Synthesis and Recognition*, 2nd Edition, Prentice Hall of India, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

OPTICAL COMMUNICATIONS TECHNOLOGY

(Professional Elective - II)

Course Code: **B1105**

L	P	C
3	-	3

UNIT - I

SIGNAL PROPAGATION IN OPTICAL FIBERS: Geometrical approach and wave theory approach, loss and bandwidth-bending loss, chromatic dispersion-chirped Gaussian pulses and controlling the dispersion profile.

UNIT - II

NONLINEAR EFFECTS OF SIGNAL IN OPTICAL FIBERS: Effective length and area, stimulated Brillouin scattering, stimulated Raman scattering, propagation in a nonlinear medium, self-phase modulation, cross phase modulation, four wave mixing, principle of solitons.

UNIT - III

FIBER OPTIC COMPONENTS -I: Couplers, isolators and circulators, multiplexers and filters Bragg gratings, fabry-perot filters, mach-zehnder interferometers, arrayed waveguide grating and high channel count multiplex architectures.

UNIT - IV

FIBER OPTIC COMPONENTS -II: Optical amplifiers, transmitters, direct and external modulation, pump sources for Raman amplifiers, switches and wavelength converters.

UNIT - V

MODULATION AND DEMODULATION: Signal formats of modulation, subcarrier modulation and multiplexing, optical duobinary modulation, optical single sideband modulation, multilevel modulation, demodulation-ideal receiver, practical direct detection receiver, bit error rates, timing recovery and equalization, error detection and correction-Reed-Solomon codes method.

UNIT - VI

TRANSMISSIONS SYSTEM ENGINEERING - OPTICAL AMPLIFIERS: System model, power penalty, transmitter, receiver, optical amplifiers, crosstalk-types, reduction and cascaded filters, dispersion limits and compensation.

UNIT - VII

TRANSMISSIONS SYSTEM ENGINEERING - FIBER NONLINEARITIES: Effective length in amplified systems, stimulated Brillouin scattering, stimulated Raman scattering, four-wave mixing, self/cross phase modulation, wavelength stabilization.

UNIT - VIII

SYSTEM DESIGN CONSIDERATIONS: Fiber type, chromatic dispersion compensation, modulation, nonlinearities and all-optical networks.

TEXT BOOKS:

1. Rajiv Ramaswami, Kumar N. Sivarajan (2004), *Optical Networks a practical perspective*, 2nd Edition, Morgan Kaufmann Publishers, New Delhi.
2. Gerd Keiser (2000), *Optical Fiber Communications,* 3rd Edition, McGraw Hill, New Delhi.

REFERENCE BOOKS:

1. John. M. Senior (2000), *Optical Fiber Communications: Principles and Practice,* 2nd edition, Pearson Education, New Delhi, India.
2. Govind Agarwal (2004), *Optical Fiber Communications*, 2nd Edition, Tata Mc graw Hill, New Delhi.
3. Harold Kolimbris (2004), *Fiber Optics Communications*, 2nd Edition, Pearson Education, New Delhi, India.
4. Uyless Black (2009), *Optical Networks: third Generation Transport Systems*, 2nd Edition, Pearson Education, New Delhi, India.
5. S. C .Gupta (2004), Optical *Fiber Communications and Its Applications,* Prentice Hall of India, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

MOBILE COMPUTING TECHNOLOGIES

(Professional Elective - II)

Course Code: **B1106**

L	P	C
3	-	3

UNIT - I

INTRODUCTION TO MOBILE COMPUTING ARCHITECTURE: Mobile computing, dialog control networks, middleware and gateways, application and services, developing mobile computing applications, security in mobile computing, architecture for mobile computing, three tier architecture, design considerations for mobile computing, mobile computing through internet, making existing applications mobile enabled.

UNIT - II

CELLULAR TECHNOLOGIES - GSM : Bluetooth, radio frequency identification, wireless broadband mobile IP, internet protocol version 6(IPv6), Java card, GSM architecture, GSM entities, call routing in GSM, PLNM interfaces, GSM addresses and identifiers, network aspects in GSM, authentication and security.

UNIT - III

GPS, GPRS, CDMA AND 3G: Mobile computing over SMS, GPRS and packet data network, GPRS network architecture, GPRS network operations, data services in GPRS, applications for GPRS, limitations of GPRS, spread spectrum technology, Is-95, CDMA versus GSM, wireless data, third generation networks, applications on 3G.

UNIT - IV

WIRELESS APPLICATION PROTOCOL (WAP) AND WIRELESS LAN: WAP - MMS wireless LAN advantages, IEEE 802.11 standards, wireless LAN architecture, mobility in wireless LAN.

UNIT - V

INTELLIGENT AND INTERNETWORKING: Introduction, fundamentals of call processing, intelligence in the networks, SS#7 signaling, IN Conceptual Model (INCM), softswitch, programmable networks, technologies and interfaces for IN.

UNIT - VI

CLIENT PROGRAMMING, PLAM OS, SYMBIAN OS, WIN CE ARCHITECTURE: Introduction, moving beyond the desktop, a peek under the hood: hardware overview, mobile phones, PDA, design constraints in applications for handheld devices, palm OS architecture, application development, multimedia symbian OS architecture, applications for Symbian , different flavours of windows CE, windows CE architecture.

UNIT - VII

J2ME: Java in the handset, the three prong approach to JAVA everywhere, JAVA 2 micro edition (J2ME) technology, programming for CLDC, GUI in MIDP, UI design issues, multimedia, record management system, communication in MIDP, security considerations in MIDP, optional packages.

UNIT - VIII

SECURITY ISSUES IN MOBILE COMPUTING: Introduction, information security, security techniques and algorithms, security protocols, public key infrastructure, trust, security models, security frameworks for mobile environment.

TEXT BOOKS:

1. Asoke K. Talukder, Roopa R Yavagal (2009), *Mobile computing – Technology, Applications and Service Creation*, Tata McGraw Hill, New Delhi.
2. Jochen Schiller (2008), *Mobile Communications*, 2nd Edition, Pearson Education, New Delhi.

REFERENCE BOOKS:

1. Vieri Vaughi, Alexander Damn Jaonvic (2007), *The CDMA 2000 system for Mobile Communications*, Pearson Education, New Delhi.
2. Adalestein (2008), *Fundamentals of Mobile & Pervasive Computing*, Tata McGraw Hill, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

RF CIRCUIT DESIGN

(Professional Elective - II)

Course Code: **B1107**

L	P	C
3	-	3

UNIT - I

INTRODUCTION TO RF ELECTRONICS: The electromagnetic spectrum, units and physical constants, microwave bands, RF behavior of passive components: tuned resonant circuits, vectors, inductors and capacitors - voltage and current in capacitor circuits, tuned RF / IF Transformers.

UNIT - II

TRANSMISSION LINE ANALYSIS: Examples of transmission lines, transmission line equations and biasing, microstrip transmission lines, special termination conditions, sourced and loaded transmission lines.

UNIT - III

SINGLE AND MULTIPORT NETWORKS: The Smith chart, interconnectivity networks, network properties and applications, scattering parameters.

UNIT - IV

MATC HING AND BIASING NETWORKS: Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks.

UNIT - V

RF PASSIVE & ACTIVE COMPONENTS: Filter basics, lumped filter design, distributed filter design, diplexer filters, crystal and saw filters, active filters, tunable filters, power combiners / dividers, directional couplers, hybrid couplers, isolators, RF Diodes, BJTs, FETs, HEMTs and Models.

UNIT - VI

RF TRANSISTOR AMPLIFIER DESIGN: Characteristics of amplifiers, amplifier circuit configurations, amplifier matching basics, distortion and noise products, stability considerations, small signal amplifier design, power amplifier design, MMIC amplifiers, broadband high power multistage amplifiers, low noise amplifiers, VGA amplifiers.

UNIT - VII

OSCILLATORS: Oscillator basics, low phase noise oscillator design, high frequency oscillator configuration, LC oscillators, VCOs, crystal oscillators, PLL synthesizer, and direct digital synthesizer.

UNIT - VIII

RF MIXERS: Basic characteristics of a mixer, active mixers, image reject and harmonic mixers, frequency domain considerations.

TEXT BOOKS:

1. Reinhold Ludwing, Pavel Bretchko (2001), *RF circuit design: Theory and applications,* Pearson Education Asia Publication, New Delhi.

REFERENCE BOOKS:

1. Mathew M. Radmangh (2001), *Radio frequency and microwave electronics illustrated*, Pearson Education Asia, New Delhi, India.
2. Joseph Carr (2004), *Secrets of RF Design*, 3rd edition, Tata Mc graw Hill, New Delhi.
3. Cotter W. Sawyer (2008), Complete Wireless Design, 2nd Edition, Mc-Graw Hill, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

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I SEMESTER

SIGNAL PROCESSING LABORATORY

Course Code: **B1108**

L	P	C
-	3	2

NOTE:

A. Minimum of 12 experiments have to be conducted.

B. All experiments may be simulated using MATLAB and to be verified theoretically.

LIST OF EXPERIMENTS:

1. Basic operations on signals, generation of various signals, and finding its FFT and IFFT of a given sequence.
2. To perform interpolation and decimation of a given sequence.
3. To Generate Dual Tone Multiple Frequency (DTMF) Signals.
4. To convert CD data into DVD Data.
5. Verification of autocorrelation theorem.
6. Implementation of linear and circular convolution.
7. Plot the periodogram of a noisy signal and estimation of PSD using Periodogram and modified Periodogram methods.
8. Estimate the power spectrum using Barlett and Welch methods.
9. Estimate the power spectrum using Blackman-Tukey methods.
10. Power spectrum estimation using Yule-Walker method.
11. Power spectrum estimation using Burg method.
12. Estimation of data series using n^{th} order Forward Predictor and comparing to the original signal.
13. Design of LPC filter using Levinson-Durbin Algorithm.
14. Computation of reflection coefficient using schur algorithm.

VARDHAMAN COLLEGE OF ENGINEERING

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II SEMESTER

CODING THEORY AND TECHNIQUES

Course Code: **B1110**

L	P	C
3	-	3

UNIT - I

INFORMATION THEORY: Mathematical model of information, a logarithmic measure of information, average and mutual information and entropy types of errors, error control strategies.

LINEAR BLOCK CODES: Introduction to linear block codes, syndrome and error detection, minimum distance of a block code, error detecting and error correcting capabilities of a block code, standard array and syndrome decoding, probability of an undetected error for linear codes over a BSC.

UNIT - II

CYCLIC CODES: Definition of cyclic codes, polynomials, generator polynomials, encoding cyclic codes, decoding cyclic codes, factors of x^n+1, parity check polynomials, dual cyclic codes, generator and parity check matrices of cyclic codes.

UNIT - III

LINEAR FEED BACK SHIFT REGISTERS FOR ENCODING AND DECODING CYCLIC CODES: Linear feedback shift registers, polynomial division register, registers for encoding, registers for error detection and correction, Meggitt decoder, cyclic hamming codes, shortened cyclic codes.

UNIT - IV

CONVOLUTION CODES: Encoding of convolution codes, structural and distance properties of convolutional codes, maximum likelihood decoding- Viterbi decoding.

UNIT - V

SEQUENTIAL AND MAJORITY LOGIC DECODING OF CONVOLUTION CODES: Stack algorithm, Fano algorithm, performance characteristics of sequential decoding, feedback decoding, distance properties and code performance. Application of viterbi decoding and sequential decoding, applications of convolution codes in ARQ system.

UNIT - VI

BURST ERROR CORRECTING CODES: Decoding of single burst error correcting cyclic codes, single burst error correcting convolutional codes, bounds on burst error correcting codes, bounds on burst error correcting capability, interleaved cyclic and convolutional codes.

UNIT - VII

GALOIS FIELDS: Roots of equations, Galois fields GF (2^3), Fields GF (2^4) and GF (2^5), primitive field elements, irreducible and primitive polynomials, solution of equations in GF (2^4) and GF (2^3).

UNIT - VIII

BCH CODES: BCH code definition, construction of BCH codes, error syndromes in finite fields, decoding SEC and DEC binary BCH codes, error location polynomial, Peterson Gorenstein Zierler decoder, reed solomon codes, Berlekamp algorithm, error evaluator polynomial.

TEXT BOOKS:

1. Shu Lin, Daniel J. Costello, Jr(1983), *Error Control Coding Fundamentals and Applications,* Prentice Hall of India, New Delhi.
2. Sal Vatore Gravano (2009), *Introduction to Error Control Codes,* Oxford University Press, New York.

REFERENCE BOOKS:

1. Man Young Rhee (1989), *Error correcting coding theory*, McGraw Hill publishing, New Delhi.
2. Bernard Sklar, Pabitra Kumar Rey *(2009), Digital communications fundamental and application,* 2nd edition, Pearson Education.
3. John G. Proakis (2008), *Digital communications,* 6th edition, Tata McGraw Hill, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

WIRELESS COMMUNICATIONS AND NETWORKS

Course Code: **B1111**

L	P	C
3	-	3

UNIT - I

WIRELESS COMMUNICATIONS & SYSTEMS: Introduction to wireless communication systems, examples, comparisons & trends, cellular concepts-frequency reuse, channel assignment strategies, handoff strategies, interference & system capacity, trunking & grade of service, improving coverage & capacity in cellular systems.

UNIT - II

MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATIONS: FDMA, TDMA, SSMA (FHMA/CDMA/Hybrid techniques), SDMA techniques (AS applicable to wireless communications), packet radio access-protocols, CSMA, protocols, reservation protocols, capture effect in packet radio, capacity of cellular systems.

UNIT - III

WIRELESS NETWORKING: Introduction, differences between wireless & fixed telephone networks, traffic routing in wireless networks- circuits switching, packet switching, X.25 protocol.

UNIT - IV

WIRELESS DATA SERVICES: Cellular digital packet data (CDPD), advanced radio data information system(ARDIS), RAM mobile data (RMD), common channel signaling (CCS), ISDN-Broadband ISDN & ATM, signaling system no .7 (SS7),network services part of SS7 ,SS7 user part, signaling traffic in SS7,SS7 services, performance of SS7.

UNIT - V

MOBILE IP AND WIRELESS APPLICATION PROTOCOL: Mobile IP, operation of mobile IP, Co-located address, registration, tunneling, WAP architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, wireless datagram protocol.

UNIT - VI

WIRELESS LAN TECHNOLOGY: Infrared LANs, spread spectrum LANs, narrow bank microwave LANs, IEEE 802 protocol architecture, IEEE802 architecture and services. 802.11 medium access control, 802.11 physical layer.

UNIT - VII

BLUE TOOTH: Overview, radio specification, base band specification, links manager specification, logical link control and adaption protocol, introduction to WLL technology.

UNIT - VIII

MOBILE DATA NETWORKS: Introduction, data oriented CDPD network, GPRS and higher data rates, short messaging service in GSM, mobile application protocol.

TEXT BOOKS:

1. Theodore, S. Rappaport (2002), *Wireless communication principles, practice*, 2nd Edition, Prentice Hall of India.
2. William Stallings (2003), *Wireless communication and networking*, Prentice Hall of India, New Delhi.
3. Kaveh Pah Laven, P. Krishna Murthy (2002), *Principles of Wireless networks*, Pearson Education, India.

REFERENCE BOOKS:

1. Kamilo Feher (1999), *Wireless Digital communications*, Prentice Hall of India, New Delhi.
2. Roger I. Freeman (2004), *Telecommunication system engineering*, 4th edition, John Wiley & Sons, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

ADHOC WIRLELESS AND SENSOR NETWORKS

Course Code: **B1112**

L	P	C
3	-	3

UNIT - I

INTRODUCTION: Cellular and adhoc wireless networks, applications of adhoc wireless networks, issues in adhoc wireless networks, adhoc wireless internet.

UNIT - II

MAC PROTOCOLS FOR ADHOC WIRELESS NETWORKS: Introduction, issues in designing a MAC protocol for adhoc wireless networks, design goals, classification of MAC protocols, contention based protocols.

UNIT - III

ROUTING PROTOCOLS FOR ADHOC WIRELESS NETWORKS: Introduction, issues in designing a routing protocol for adhoc wireless networks, classification, table-driven routing protocols, on-demand routing protocols, hybrid routing protocols, hierarchical routing protocols, power-aware routing protocols.

UNIT - IV

MULTICAST ROUTING IN ADHOC WIRELESS NETWORKS: Introduction, issues in designing a multicast routing protocol, operation, an architecture reference model, classifications, tree-based multicast routing protocols, mesh-based multicast routing protocols, distributed power-aware and energy efficient multicast routing protocols.

UNIT - V

TRANSPORT LAYER AND SECURITY PROTOCOLS: Introduction, issues in designing a transport layer protocol for adhoc wireless networks, design goals, classification, TCP over adhoc wireless networks, Security in adhoc wireless networks, network security requirements, issues and challenges in security provisioning, network security attacks, key management, secure routing in adhoc wireless networks.

UNIT - VI

QUALITY OF SERVICE IN ADHOC WIRELESS NETWORKS: Introduction, issues and challenges in providing QoS in adhoc wireless networks, classification of QoS solutions, MAC layer solutions, network layer solutions, QoS frameworks for adhoc wireless networks, QoS Models.

UNIT - VII

ENERGY MANAGEMENT IN ADHOC WIRELESS NETWORKS: Introduction, need for energy management in adhoc wireless networks, classification of energy management schemes, battery management schemes, transmission power management schemes, system power management schemes.

UNIT - VIII

WIRELESS SENSOR NETWORKS: Introduction, sensor network architecture, data dissemination, data gathering, MAC protocols for sensor networks, location discovery, quality of a sensor network, evolving standards, other issues.

TEXT BOOKS:

1. C. Siva Ram Murthy, B.S. Manoj (2004), *Adhoc wireless networks architecture and protocols*, Prentice Hall of India, New Delhi.
2. Jagannathan Sarangapani (2007), *Wireless Adhoc and sensor networks, protocols, performance and control*, CRC press, New Delhi.

REFERENCE BOOKS:

1. C. K. Toh (2009), *Adhoc mobile wireless networks protocols & systems*, Pearson Education India, New Delhi.
2. C .S. Raghavendra, Krishna M. Sivalingam (2004*), Wireless sensor networks*, Springer Science, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

SPREAD SPECTRUM COMMUNICATIONS

Course Code: **B1113**

L	P	C
3	-	3

UNIT - I

SPREAD SPECTRUM TECHNIQUES: Introduction, processor gain and jamming margin, DS system, FH-TH-Hybrid forms.

UNIT - II

CODING FOR COMMUNICATIONS AND RANGING: Maximal sequences, linear code generator configuration, autocorrelation and cross correlation codes, composite codes, bit rate and code length, choosing linear code, generating high rate codes.

UNIT - III

MODULATION AND MODULATORS: Balanced modulation, effects of carrier and code rate spurious, quadri phase modulation, carrier modulation trade-offs, effect of synch acquisition, side lobe energy output frequency synthesis for spread spectrum modulation, sending the information, carrier modulation, clock rate modulation, code modification, digitizing methods, frequency hopping code modifiers.

UNIT - IV

CORRELATION AND DEMODULATION: Remapping the spread spectrum, effect of non synchronous input signals, baseband recovery, phase locked loops, squaring loops, Costas loop demodulators, fm feedback demodulators, PDM demodulation, FH demodulation, integrate and dump filters, the dehopped signal, M-ary detection.

UNIT - V

SYNCHRONIZATION: Initial synchronization, the "sliding" correlator, synchronization preambles, frequency hop synchronization, transmitted reference methods, universal timing, burst synchronization, sequential ,special coding for synch acquisition, matched filter synchronizers, synch recognition Tan-Dither tracking, delay-lock tracking, split-bit tracking.

UNIT - VI

TRANSMITTER AND RECEIVER DESIGN: Noise figure and co-channel users, dynamic range and AGC, the propagation medium, LOS loss, adsorptive losses, differential phase delay, multipath, transmitter power amplification, receiver RF consideration, receiver signal handling capacity, wideband front ends, the ideal RF section, bandwidth and phase shift effects.

UNIT - VII

NAVIGATING WITH SPREAD SPECTRUM METHODS: Ranging techniques, tone ranging, sources of range error, frequency hopping range measurement, more on selection of clock rate, selecting the ranging code, hybrid ranging system, direction finding, special antennas.

UNIT - VIII

TEST, EVALUATION AND APPLICATIONS OF SPREAD SPECTRUM SYSTEMS:

Sensitivity, selectivity, jamming margin, synch acquisition, loss of synchronization, SNR vs. interference level, process gain, the FCC method, cross correlation, transmitter measurements, applications of space systems, avionics systems, test systems and equipment, message protection, position location and real time systems.

TEXT BOOKS:

1. Rober C. Dixon (1994), Spread *spectrum systems*, 3rd edition, John Wiley and sons, New Delhi.
2. Simon R. Sownders, Alejandro Aragon-Zavala (2008), *Antennas and Propagation for wireless communication systems,* John Wiley and sons, New Delhi.

REFERENCE BOOKS:

1. Mischa Schwatz (2005), *Mobile Wireless communications*, Cambridge University press, UK.
2. L. Hanzp, M. Munster, B. J.choi, T. Kellu (2003), *OFDM and MC-CDMA*, John Wiley & Sons, UK.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

NETWORK SECURITY AND CRYPTOGRAPHY

(Professional Elective - III)

Course Code: **B1413**

L	P	C
3	-	3

UNIT - I

INTRODUCTION SECURITY ATTACKS: Interruption, interception, modification and fabrication.

SECURITY SERVICES: Confidentiality, authentication, integrity, non repudiation, access control and availability.

SECURITY MECHANISMS: A model for internetwork security, internet standards and RFCs, conventional encryption principles, ceaser cipher, hill cipher, poly and mono alphabetic cipher.

UNIT - II

ENCRYPTION PRINCIPLES: Conventional encryption algorithms: Feistal structure, DES algorithm, S: Boxes, Triple DES, advanced data encryption standard (AES), cipher block modes of operation, location of encryption devices, Key distribution Approaches.

UNIT - III

CRYPTOGRAPHY AND APPLICATIONS : Public key cryptography principles, public key cryptography algorithms, digital signatures, RSA, elliptic algorithms, digital certificates, certificate authority and key management, Kerberos, X.509, directory authentication service. Message authentication, secure hash functions and HMAC.

UNIT - IV

ELECTRONIC MAIL SECURITY: Email privacy, PGP operations, radix: 64 conversions, key management for PGP, PGP trust model, multipurpose internet mail extension (MIME), secure/MIME(S/MIME).

UNIT - V

IP SECURITY ARCHITECTURE AND SERVICES: IP security overview, IP security architecture, security association, authentication header, encapsulating security payload, combining security associations and key management, OAKELY key determination protocol, ISAKMP.

UNIT - VI

WEB SECURITY: Web security considerations, secure socket layer (SSL) and transport layer security (TLS), secure electronic transaction (SET).

UNIT - VII

NETWORK MANAGEMENT SECURITY: Basic concepts of SNMP, SNMPv1 community facility and SNMPv3. System Security, intruders, intrusion techniques, intrusion detection, password management, bot nets.

UNIT - VIII

MALICIOUS SOFTWARE: Viruses and related threats, virus counter measures, distributed denial of service attacks.

FIREWALLS: Firewall design principles, trusted systems, common criteria for information technology security evolution.

TEXT BOOKS:

1. William Stallings (2007), *Network Security Essentials (Applications and Standards*), 3rd Edition, Pearson Education, New Delhi, India.
2. William Stallings (1998), *Cryptography and network Security*, 3rd Edition, Prentice Hall of India, New Delhi, India.

REFERENCE BOOKS:

1. Eric Maiwald (2004), *Fundamentals of Network Security*, Dreamtech press, India.
2. Charlie Kaufman, Radia Perlman, Mike Speciner (2002), *Network Security: Private Communication in a Public World*, 2nd Edition, Pearson Education, India.
3. Robert Bragg, Mark Rhodes (2004), *Network Security: The Complete Reference*, Tata Mcgraw Hill, New Delhi.
4. Buchmann (2004), *Introduction to Cryptography*, 2nd Edition, Springer, USA.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES

(Professional Elective - III)

Course Code: **B1414**

L	P	C
3	-	3

UNIT - I

INTORODUCTION TO DIGITAL SIGNAL PROCESING: Introduction, digital signal-processing system, the sampling process, discrete time sequences. discrete Fourier transform (DFT) and fast Fourier transform (FFT), linear time-invariant systems, digital filters, decimation and interpolation, analysis and design tool for DSP systems MATLAB, DSP using MATLAB.

UNIT - II

COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS: Number formats for signals and coefficients in DSP systems, dynamic range and precision, sources of error in DSP implementations, A/D conversion errors, DSP computational errors, D/A conversion errors, compensating filter.

UNIT - III

ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES: Basic architectural features, DSP computational building blocks, bus architecture and memory, data addressing capabilities, address generation unit, programmability and program execution, speed issues, features for external interfacing.

UNIT - IV

EXECUTION CONTROL AND PIPELINING: Hardware looping, interrupts, stacks, relative branch support, pipelining and performance, pipeline depth, interlocking, branching effects, interrupt effects, and pipeline programming models.

UNIT - V

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS : Commercial digital signal-processing devices, data addressing modes of TMS320C54XX DSPs, data addressing modes of TMS320C54XX processors, memory space of TMS320C54XX processors, program control, TMS320C54XX instructions and programming, on-chip peripherals, interrupts of TMS320C54XX processors, pipeline operation of TMS320C54XX processors.

UNIT - VI

IMPLEMENTATIONS OF BASIC DSP ALGORITHMS: The Q-notation, FIR filters, IIR filters, interpolation filters, decimation filters, PID controller, adaptive filters, 2-D signal processing.

UNIT - VII

IMPLEMENTATION OF FFT ALGORITHMS : An FFT algorithm for DFT computation, a Butterfly computation, overflow and scaling, bit-reversed index generation, an 8-Point FFT implementation on the TMS320C54XX, computation of the signal spectrum.

UNIT - VIII

INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Memory space organization, external bus interfacing signals, memory interface, parallel I/O interface, programmed I/O, interrupts and I/O, direct memory access (DMA). a multichannel buffered serial port (McBSP), McBSP programming, a CODEC interface circuit, CODEC programming, a CODEC-DSP interface example.

TEXT BOOKS:

1. Avtar Singh, S. Srinivasan (2004), *Digital Signal Processing Implementations*, Thomson Publications, India.
2. Lapsleyetal. S (2000), *DSP Processor Fundamentals, Architectures & Features,* S. Chand & Co, New Delhi.

REFERENCE BOOKS:

1. B. Venkata Ramani, M. Bhaskar (2004), *Digital Signal Processors, Architecture, Programming and Applications*, Tata Mcgraw Hill, New Delhi.
2. Jonatham Stein (2005), *Digital Signal Processing,* John Wiley & Sons, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

VOICE OVER INTERNET PROTOCOL

(Professional Elective - III)

Course Code: **B1114**

L	P	C
3	-	3

UNIT - I

OVERVIEW OF IP PROTOCOL SUITE: The internet protocol, the transmission control protocol (TCP), the user datagram protocol (UDP), the real-time transport protocol (RTP), IP multicast, IP version 6 (IPv6), interworking IPv4 and IPv6, the VoIP market, VoIP challenges.

UNIT - II

VOIP NETWORKS: Introduction to VOIP networks, PSTN, QoS, architecture overview, making VoIP calls, deployment issues, applications and services.

UNIT - III

VOIP CODECS: Codec design overview, narrowband, wideband and multirate codecs, VOIP softwares, performance of VOIP codecs.

UNIT - IV

VOIP PROTOCOLS: H.323 and H.245 standards, the H.323 architecture, call signaling, call scenarios, H.245 control signaling conference calls, the decomposed gateway.

UNIT - V

THE SESSION INITIATION PROTOCOL (SIP): SIP architecture, overview of SIP messaging syntax, examples of SIP message sequences, redirect servers, proxy servers, the session description protocol (SDP), usage of SDP with SIP.

UNIT - VI

VOIP AND SS7: The SS7 protocol suite, the message transfer part (MTP), ISDN user part (ISUP) and signaling connection control part (SCCP), SS7 network architecture, signaling points(SPs), single transfer point (STP), service control point(SCP), message signal units (MSUs), SS7 addressing, ISUP, performance requirements for SS7, sigtran, sigtran architecture, SCTP, M3UA operation, M2UA operation, M2PA operation.

UNIT - VII

INTERWORKING SS7 AND VOIP ARCHITECTURES: Interworking soft switch and SS7, interworking H.323 and SS7.

UNIT - VIII

QUALITY OF SERVICE (QOS): Need for QoS, end-to-end QoS, overview of QOS solutions, the resource reservation Protocol(RSVP), Diffserv, the Diffserv architecture, multi-protocol label switching (MPLS), the MPLS architecture, MPLS traffic engineering, label distribution protocols and constraint based routing.

TEXT BOOKS:

1. Daniel Collins (2005), *Carrier Grade Voice over IP*, 2nd edition, Tata McGraw Hill, India.
2. Samrat Ganguly, Sudeept Bhatnagar (2008), *VoIP: wireless, P2P and New Enterprise Voice over IP*, John Wiley and Sons, New Delhi.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

OPTICAL NETWORKS

(Professional Elective - IV)

Course Code: **B1115**

L	P	C
3	-	3

UNIT - I

CLIENT LAYERS OF THE OPTICAL NETWORKS: SONET/SDH -multiplexing, frame structure, physical layer, infrastructure, ATM – functions, adaptation layers, QoS, flow control, Signaling and Routing, IP -routing and forwarding, QoS, MPLS, storage area networks - ESCON, fiber channel, HIPPI and Gigabit ethernet.

UNIT - II

WDM NETWORK ELEMENTS: Optical Line terminals and amplifiers, Add/Drop Multiplexers- OADM Architecture and reconfigurable OADMS, Optical cross connects, all-optical OXC configurations.

UNIT - III

WDM NETWORK DESIGN: Cost tradeoffs in network design, LTD and RWA problems, dimensioning wavelength routing networks, statistical and maximum load dimensioning models.

UNIT - IV

NETWORK CONTROL AND MANAGEMENT: Network management functions, optical layer services and interfacing, layers within optical layer, multivendor interoperability, performance and fault management, configuration management and optical safety.

UNIT - V

NETWORK SURVIVABILITY: Basic concepts, protection in SONET/SDH links and rings, protection in IP networks, optical Layer protection service classes, protection schemes and Interworking between layers.

UNIT - VI

ACCESS NETWORKS: Network architecture, enhanced HFC, FTTC- PON evolution.

UNIT - VII

PHOTONIC PACKET SWITCHING: OTDM, synchronization, header processing, buffering, burst switching and test beds.

UNIT - VIII

DEPLOYMENT CONSIDERATIONS: SONET/SDH core network, architectural choices for next generation transport networks, designing the transmission layer using SDM, TDM and WDM, unidirectional and bidirectional WDM systems, long haul and metro networks.

TEXT BOOKS:

1. Rajiv Ramaswami, Kumar N. Sivarajan (2004), *Optical Networks a practical perspective*, 2nd edition, Morgan Kaufmann Publishers.
2. C. Siva Rama Murthy, Mohan Guruswamy (2003), *WDM Optical Networks: Concepts, Design and Algorithms,* 2nd edition, Pearson Education, India.

REFERENCE BOOKS:

1. Uyless Black (2009), *Optical Networks: third Generation Transport Systems*, 2nd edition, Pearson Education, New Delhi, India.
2. John. M. Senior (2000), *Optical Fiber Communications: Principles and Practice,* 2nd edition, Pearson Education, New Delhi, India.
3. Harold Kolimbris (2004), *Fiber Optics Communications*, 2nd edition, Pearson Education, New Delhi, India.
4. Timothy S. Ramteke (2004), *Networks*, 2nd edition, Pearson Education, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

SOFTWARE DEFINED RADIO

(Professional Elective - IV)

Course Code: **B1116**

L	P	C
3	-	3

UNIT - I

INTRODUCTION TO SOFTWARE RADIO CONCEPTS: The need of software radios, what is software radio, characteristics and benefits of software radio, design principles of software radio, RF implementation issues, the purpose of RF front end, dynamic range.

UNIT - II

RADIO FREQUENCY IMPLEMENTATION ISSUES: The principal challenge of receiver design, RF receiver front end topologies, enhanced flexibility of the RF chain with software radios, importance of the components to overall performance, transmitter architectures and their issues, noise and distortion in the RF chain, ADC and DAC distortion.

UNIT - III

MULTI RATE SIGNAL PROCESSING: Introduction, sample rate conversion principles, polyphase filters, digital filter banks, timing recovery in digital receivers using machine digital filters.

UNIT - IV

DIGITAL GENERATION SIGNALS: Introduction, comparison of direct digital synthesis with analog signal synthesis- approaches to direct digital synthesis, analysis of spurious signals, spurious components due to periodic jitter, band pass signals generation, performance of direct digital synthesis, hybrid DSS PLL systems, applications of direct digital synthesis, generation of random sequences, ROM compression technologies, sine phase difference algorithm approach, modified sine phase difference approach.

UNIT - V

ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERSATION: Parameters of ideal data converters, parameters of practical data convertors, analog to digital and digital to analog conversion techniques to improve data converter performance, common ADC and DAC architectures.

UNIT - VI

SMART ANTENNAS: Vector channel modeling, benefits of smart antennas- structures of beam forming systems, smart antenna, algorithms, diversity and space time adaptive signals processing, algorithms for transmit STAP, hardware implementation of smart antennas, array calibration.

UNIT - VII

DIGITAL HARDWARE CHOICES: Introduction, key hardware elements, DSP processors, field programmable gate arrays, tradeoffs in using DSPs, FPGAs and ASICs power management issues using communication of DSP, FPGAs and ASICs.

UNIT - VIII

OBJECT ORIENTED REPRESENTATION OF RADIOS AND NETWORK RESOURCES: Networks, object oriented programming, object brokers, mobile applications environments, joint tactical radio systems.

CASE STUDIES IN SOFTWARE RADIO DESIGN: Introduction and historical perspective SPEAK easy, JTRS, JTRs wireless information transfer system, SDR-3000 digital transceiver subsystem, spectrum ware, CHARIOT.

TEXT BOOKS:

1. Jeffrey H. Redd (2002), *Software Radio: A modern Approach to Radio Engineering*, Pearson Education Asia, New Delhi, India.
2. Walter Tuttle Bee (2002), *Software Define Radio Fabrication Technologies*, Wiley publications, New Delhi, India.

REFERENCE BOOKS:

1. Paul Burns (2002), *Software Defined Radio for 3G*, Arech House, Norwood, MA, United States.
2. Markus Dilinger, Kambiz Madani, Nancy Alonistioti (2002), *Software Defined Radio: Architectures, Systems and Functions,* John Wiley and Sons, New Delhi, India.
3. Josephal Itola III (2000), *Software Radio Architecture: Object Oriented Approaches to Wireless of System Engineering,* John Wiley & sons, New Delhi.
4. B.Razavi (1998), *R.F. Mocroelectronics*, Prentice Hall of India.
5. S. K. Mithra (1998), *DSP – A Computer based Approach*, Tata McGraw Hill, New Delhi, India.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

PROPAGATION MODELS FOR WIRELESS COMMUNICATIONS

(Professional Elective - IV)

Course Code: **B1117**

L	P	C
3	-	3

UNIT - I

BASIC PROPAGATION MODELS: Definition of path loss, noise modeling, free space loss, planet earth loss link budgets.
PROPAGATION MECHANISMS: Reflection, refraction and transmission, rough surface scattering, geometrical optics, diffraction.

UNIT - II

MACROCELLS: Definition of parameters, empirical path loss models, physical models, ITU-R models, comparison of models.
SHADOWING: Statistical characterization, physical basis for shadowing, impact on coverage, location variability, correlated shadowing.

UNIT - III

FAST FADING: Baseband channel representation, AWGN Channel, narrow band fading channel, rayleigh, rice and Nackagami-m distribution, second order fast-fadding statics, autocorrelation function, effect of wideband fading, wide band channel model, wide band channel parameters, frequency domain effects and Bello functions.

UNIT - IV

MICROCELLS: Empirical models, physical models, line-of-sight models, non-line-of- sight models.
PICOCELLS: Empirical models of propagation with in buildings, physical models of indoor propagation, models of propagation into buildings, shadowing, multipath effects, ultra wide band indoor propagation, and indoor link budgets.

UNIT - V

MEGACELLS: Shadowing and fast fading, empirical narrowband models, statistical models, shadowing statistics, physical-statistical models for built-up areas, wide band models, multi-satellite correlations, overall mobile satellite channel mode.

UNIT - VI

OVERCOMING NARROWBAND FADING: Space diversity, polarization diversity, time diversity, frequency diversity and combining methods, macrodiversity, transmit diversity

UNIT - VII

OVERCOMING WIDEBAND FADING: System modeling, linear equalizers, adaptive equalizers, non-linear equalizers, Rake receivers and OFDM receivers.

UNIT - VIII

CHANNEL MEASUREMENTS FOR MOBILE SYSTEMS: Application for channel measurements, Impact of Measurement in accuracies, signal sampling issues, measurement systems equipment calibration and validation outdoor and indoor measurements.

TEXT BOOKS:

1. Simon R. Saunders, Alejandro Aragon Zavala (2007), *Antennas and propagation for Wireless Communication Systems,* 2nd edition, Wiley student Edition, USA.
2. William Stallings (2009), *Wireless Communication & Networks,* 2nd edition, Pearson Education India, New Delhi.

REFERENCE BOOKS:

1. Andreas F. Molisch (2011), *Wireless Communications,* 2nd Edition, John Wiley and Sons, UK.

VARDHAMAN COLLEGE OF ENGINEERING

(Autonomous)

II SEMESTER

ADVANCED COMMUNICATIONS LABORATORY

Course Code: **B1118**	**L**	**P**	**C**
	-	**3**	**2**

NOTE:

A. Minimum of 12 Experiments have to be conducted

B. All Experiments may be simulated using MATLAB and to be verified using related training kits

LIST OF EXPERIMENTS:

1. Characterization of LED
2. Intensity modulation of Laser output through optical fiber
3. Determination of numerical aperture of given optical fibers
4. Determination of losses in optical fibers
5. Verification of minimum distance in hamming code
6. Measurement of bit error rate using binary data
7. Point detection, edge detection and line detection using derivative operators
8. Effect of sampling and quantization of an image
9. To perform FFT, IFFT, DCT and IDCT of given image
10. Error detection and correction by convolution codes
11. Modulation and demodulation of QPSK
12. Efficiency of DS Spread – Spectrum Technique.
13. Simulation of Frequency Hopping (FH) system.
14. Observing the waveforms at various test points of a mobile phone using mobile phone trainer.
15. Study of Direct sequence spread spectrum modulation & demodulation using CDMA – DSS – BER Trainer.
16. Study of ISDN training system with protocol analyzer.

M. Tech. WMC I / II SEMESTER

TECHNICAL SEMINAR

L	T	P	C
-	-	-	2

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. WMC III SEMESTER

COMPREHENSIVE VIVA

Course Code: **B1120**

L	T	P	C
-	-	-	4

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. WMC 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. 2. 3. 4. 5.	Inner title page Abstract or Synopsis Acknowledgments Table of Contents 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

	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.	seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
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.