



SVR ENGINEERING COLLEGE

(Sponsored by Little Flower Educational Society, Approved by AICTE, Affiliated by JNTUA)

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2.5.1 Mechanism of internal/external assessment is transparent and the grievance redressal system is time-bound and efficient

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (AUTONOMOUS)
ANANTHAPURAMU – 515 002 (A.P) INDIA

Academic Regulations 2015 (R15) for B. Tech (Regular)

(Applicable for the students admitted during the
Academic Year 2015-2016 and onwards)

1. Eligibility for Admission:

Admission to the B.Tech. program shall be made subject to the eligibility, qualification and specialization prescribed by the University for each program from time to time.

- i. Admission shall be made either on the basis of merit/rank obtained by the qualifying candidates in EAMCET/ECET or otherwise specified, whichever is relevant.

The duration of B.Tech program is of four academic years divided into eight semesters comprising of two semesters in each academic year. A student is required to choose a branch of study at the time of admission. Students under lateral entry will be admitted straightaway into Third semester of B.Tech course in the respective branch. No change of branch shall be allowed after the admissions are closed.

2. Award of B.Tech. Degree:

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

- i. Regular entry students shall pursue a course of study for not less than four academic years and in not more than eight academic years.
- ii. Regular entry students shall register for 224 credits and secure all 224 credits
- iii. Lateral entry students shall pursue a course of study for not less than three academic years and in not more than six academic years for.
- iv. Lateral entry students shall register for 170 credits and secure all 170 credits
- v. Student's who fail to fulfill all the academic requirements for the award of the degree within eight academic years (for Regular Entry) / six academic years (for Lateral Entry) from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.
- vi. The students who have availed one year or two year gap period, shall have to fulfill all the academic requirements for the award of the degree within nine academic years or ten academic years, respectively otherwise they shall forfeit their seat in B.Tech course and their admission is cancelled.

Completing the course of study shall mean not only satisfying the attendance requirements but also passing of all the subjects and acquiring required number of credits within the respective stipulated period

3. Branches of study:

The following Branches of study are offered at present for B. Tech. degree

S.No. Branch

1. Civil Engineering
2. Electrical and Electronics Engineering.
3. Mechanical Engineering.
4. Electronics and Communication Engineering
5. Computer Science and Engineering.
6. Chemical Engineering

and any other branch as approved by the authorities of the University from time to time.

Each Branch will have a curriculum with a syllabi that shall consist of the following:

- i. General Core Courses
 1. Basic Sciences
 2. Engineering Sciences
 3. Humanities and social sciences
- ii. Program core courses in Engineering / Technology
- iii. Elective courses of Engineering / Technology / Management Entrepreneurship / Business Communication and allied fields.
- iv. Open Electives/CBCS/MOOCs/Audit Courses
- v. Mandatory learning courses
- vi. Project work

4. Credits:

	Semester	
	Periods / Week	Credits
Theory	04	04
Comprehensive Examination	--	01
Practical	03	02
Seminar	--	02
Project Work	12	8

- i. *Academic Year*: Two consecutive (one odd + one even) semesters constitute one academic year.
- ii. *Choice Based Credit System (CBCS)*: The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
- iii. *Credit*: A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.

5. Distribution and Weightage of Marks (Internal & External):

- i. The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition seminar and project work shall be evaluated for 100 and 200 marks respectively.
- ii. For theory subjects the distribution shall be 40 marks for Internal Evaluation and 60 marks for the External Evaluation.
- iii. There shall be five units in each of the theory subjects.
- iv. For theory subjects, there shall be Two Internal examinations during the semester. Each Internal examination shall consist of an objective test for 10 marks and a subjective test for 20 marks with duration of 20 and 90 minutes respectively.

Objective test paper is set for 20 multiple choice questions for 10 marks. *Subjective test paper shall contain three questions, EITHER/OR type shall be evaluated for 10 marks for each, then condensed for 20 marks, any fraction rounded off to the next higher mark. First midterm examination shall be conducted for half of the syllabus and second internal examination shall be conducted for remaining half of the syllabus. Both the internal exams are compulsory. Final Internal marks for a total of 30 marks shall be arrived at by considering the marks secured by the student in both the internal examinations with 70% weightage to the better internal exam and 30% to the other. Only, the fraction if any in total internal examination marks shall be rounded off to the next higher mark.

*Subjective test changed to EITHER/OR type w.e.f. October, 2016

Note: The internal examination shall be conducted first by distribution of the Objective test paper simultaneously marking the attendance, after 20 minutes the answered objective

test paper is collected back. The student is not allowed to leave the examination hall. Then the subjective test paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are to be collected back.

- v. For the remaining 10 marks in internal evaluation, the faculty members teaching the subject shall evaluate the students through a minimum of 2 individual/group assignments or through a mini project with a group of six students or through a term paper/Data collection or through internet based seminar presentations, etc...
- vi. For theory subjects, there will be six questions with following pattern in the End-Examination.
 - a. All Questions have to be answered compulsorily.
 - b. Question I shall contain 5 short Answer questions “a” to “e” each of 2 marks. (Total 10 marks) covering one question from each unit.
 - c. Out of the remaining five questions, EITHER/OR type shall be followed with 10 marks for each.
 - d. In each question as mentioned in (c), one, two or more bits can be set.
- vii. Further, whenever any theory subject with two parts is offered (combined subject), for ex: Electrical & Mechanical Technology, then there shall be only two parts Part A, Part B in the question paper.
Part – A: shall contain three questions, EITHER/OR type shall be followed with 10 marks for each.
Part – B: shall also contain three questions, EITHER/OR type shall be followed with 10 marks for each.
- viii. Model Question paper for each theory course shall be prepared by the subject teacher/expert within 15 days from the commencement of the semester and the same shall be forwarded to the Controller of Examinations through the Chairman, BOS concerned.
- ix. For practical subjects there shall be a continuous evaluation during the semester for 40 internal marks and 60 end examination marks. Day-to-day work in the laboratory shall be evaluated for 40 marks by the concerned laboratory teacher based on the report of experiments/jobs. The end examination shall be conducted by the laboratory teacher and another examiner from the same department.

Discussion pending

- x. There shall be an audit pass (Mandatory learning Course) course in Human Values & Professional Ethics and Advanced Communication Skills lab with no credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance and student shall be declared pass in the audit course when he/she secures 40% or more in the internal examinations. If the student fails to achieve 40% of marks in internal examination, a makeup examination shall be conducted in the forthcoming semester.
- xi. There shall be an Discipline centric Elective Course through Massive Open Online Course (MOOC) in III year II semester (For EEE, ECE, CSE branches) and in IV year I semester (For Civil, Mechanical, Chemical Engineering branches), where in the student shall register the course offered by authorized institutions/Agencies, through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subject offered and the mentor appointed shall conduct the internal examination following the guidelines given in 5(iv) & 5(v). Further, the College shall conduct the external examination for the MOOC subject in line with other regular subjects (5.vi) based on the syllabi of the respective subject provided by the Head of the Department.

- xii. The Certificate issued by the institution/agency after successful completion of the course will be considered for the award of grade to that course. There shall be an Open Elective in III year II semester, where in the students have to choose an elective offered by the departments other than their department.
- xiii. There shall be **Four Comprehensive Objective Type Examinations, one each** with 100 objective questions for 100 marks at the end of II year I semester, II year II semester, III year I semester and III year II semester. The duration of the examination would be for 2 hours. A student shall acquire 1 credit each assigned to the comprehensive examination, only when he/she secures 40% or more marks in the examination. In case, if a student fails in comprehensive examination, he/she shall reappear for the examination by following a similar procedure adopted for the theory examinations.
- xiv. For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, the distribution shall be 40 marks for internal evaluation and 60 marks for end examination. The Internal evaluation will be 20 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. Further, there shall be two midterm exams in a Semester for duration of 2 hrs each, evenly distributed over the syllabi for 20 marks and the average marks of both the mid examinations shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final internal marks for the subject. The pattern and duration of the examination pertaining to these specific subjects shall be finalized by the BOS Chairman and need to be clearly mentioned at the end of syllabus.
- xv. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department before presentation. The report and the presentation shall be evaluated by the Departmental committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar shall be evaluated for 100 marks. There shall be no external examination for seminar. A student shall acquire 2 credits assigned to the seminar only when he/she secures 40 marks on aggregate out of 100 marks allocated. In case, if a student fails in seminar, he/she shall reappear for the makeup seminar by following a similar procedure adopted for the theory examinations.
- xvi. Out of a total of 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the End Semester Examination (Viva-voce). The viva-voce shall be conducted by a committee consisting of Head of the Department, Project Supervisor and an External Examiner nominated by the Principal from the panel of 3 members proposed by Head of the Department. The project work shall start in IV year I semester and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year II semester. The Internal Evaluation shall be made by the departmental committee consisting of Head of the Department, project supervisor and one senior faculty member, on the basis of two seminars (one at the beginning of IV B.Tech II semester and the other before submission of project work) given by each student on the topic of his project work. In case, if a student fails in project work viva-voce, he/she shall reappear for the viva-voce examination by following a similar procedure adopted for the practical examinations.
- xvii. The laboratory records, assignment records and internal test papers shall be collected at the end of each semester and shall be preserved for minimum of 3 years in the respective departments and shall be produced to the Committees of the college as and when the same are asked for.

6. Attendance Requirements:

- i. A student shall be eligible to appear for end examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- ii. **Shortage of Attendance below 65% in aggregate shall in NO case be condoned.**
- iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.
- vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

7. Minimum Academic Requirements (For Regular Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.
- ii. A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing **41 credits (50%)** of the subjects that have been studied up to II year I semester from
 - a. Two regular and one supplementary examinations of I year I semester
 - b. One regular and one supplementary examination of I year II semester.
 - c. One regular examination of II year I semester
irrespective of whether the candidate takes the end examination or not as per the normal course of study.
- iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing **70 credits (50%)** of the subjects that have been studied upto III year I semester from the following examinations,
 - a. Three regular and two supplementary examinations of I year I semester.
 - b. Two regular and two supplementary examination of I year II semester.
 - c. Two regular and one supplementary examinations of II year I semester.
 - d. One regular and one supplementary examinations of II year II semester.
 - e. One regular examination of III year I semester.
irrespective of whether the candidate takes the end examination or not as per the normal course of study.

And in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

- iv. A student shall register and put up minimum attendance in all 224 credits and earn all the 224 credits. Marks obtained in all 224 credits shall be considered for the calculation of percentage of marks obtained.
- v. Students who fail to earn 224 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

8. Minimum Academic Requirements (For Lateral Entry Students):

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures

not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In the Seminar he/she should secure 40%.

- ii. A student shall be promoted from III to IV year only if he/she fulfils the academic requirement of securing **43 credits (50%)** of the subjects that have been studied up to III year I semester from
 - a. Two regular and one supplementary examinations of II year I semester
 - b. One regular and one supplementary examination of II year II semester.
 - c. One regular examination of III year I semester
 irrespective of whether the candidate takes the end examination or not as per the normal course of study.

and in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

- iii. A student shall register and put up minimum attendance in all 170 credits and earn all the 170 credits. Marks obtained in all 170 credits shall be considered for the calculation of percentage of marks obtained.
- iv. Students who fail to earn 170 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

9. Grading:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade points assigned
≥ 95	S	10
90-94	A1	9.5
85-89	A2	9.0
80-84	A3	8.5
75-79	B1	8.0
70-74	B2	7.5
65-69	C1	7.0
60-64	C2	6.5
55-59	D1	6.0
50-54	D2	5.5
45-49	E1	5.0
40-44	E2	4.5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

- i. A student obtaining Grade „F“ shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.
- ii. For non credit (Audit) courses „Satisfactory“ or “Notsatisfactory“ shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

9.1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

$$SGPA = \Sigma (C_i \times G_i) / \Sigma C_i$$

Where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

- ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

$$CGPA = \Sigma (C_i \times S_i) / \Sigma C_i$$

Where „ S_i “ is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

- iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv. While computing the GPA/CGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters as mentioned in the above table.

10. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year II semester to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the maximum time for graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for having the Gap Year.

11. Transitory Regulations:

- i. Candidates who have been detained for want of attendance or 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, subject to Section 2.v and they will be in the academic regulations into which the candidate is presently readmitted.
- ii. Candidates who were permitted with Gap Year(s) shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work, subject to Section 2.vi and they will be in the academic regulations into which the candidate is presently rejoining.
- iii. In case of regulation change, the maximum credits the student shall acquire for the award of the degree shall be the sum of the total number of credits he/she secured during the course work he/she pursued in old regulations and the total number of credits he/she will be securing in the remaining course work in new regulations. The minimum academic requirement credits for promotion shall also change accordingly.
- iv. End semester Examinations under Old regulations shall be conducted in subjects of each year three times after the conduct of last regular examinations under those regulations.
- v. Candidates who satisfies the attendance requirements in any year under old regulations but who are yet to pass some subjects of that year even after three chances as stated in 11(iv) shall appear for the equivalent subjects specified by the Board of Studies of the concerned branch.

12. Conduct and Discipline:

- i. Students shall conduct themselves within and outside the precincts of the Institute in a manner befitting the students of an Institute of national importance.
- ii. As per the order of the Hon^{ble} Supreme Court of India, ragging in any form is banned: acts of ragging will be considered as gross indiscipline and will be severely dealt with.

- iii. The following additional acts of omission and/or commission by the students within or outside the precincts of the College shall constitute gross violation of code of conduct and are liable to invoke disciplinary measures:
- (a) Ragging
 - (b) Lack of courtesy and decorum; indecent behavior anywhere within or outside the campus.
 - (c) Willful damage or stealthy removal of any property/belongings of the Institute/Hostel or of fellow students.
 - (d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs (e) Mutilation or unauthorized possession of library books
 - (f) Hacking in computer systems
 - (g) Furnishing false statement to the disciplinary committee, or willfully withholding information relevant to an enquiry.
 - (h) Organizing or participating in any activity that has potential for driving fellow students along lines of religion, caste, batch of admission, hostel or any other unhealthy criterion.
 - (i) Resorting to noisy and unseemly behavior, disturbing studies of fellow students.
 - (j) Physical or mental harassment of freshers through physical contact or oral abuse.
 - (k) Adoption of unfair means in the examination.
 - (l) Organizing or participating in any group activity except purely academic and scientific programmes in company with others in or outside the campus without prior permission of the Principal.
 - (m) Disturbing in drunken state or otherwise an incident in academic or student function or any other public event.
 - (n) Not obeying traffic rules in campus, not following safety practices or causing potential danger to oneself or other persons in any way.
 - (o) Any other act of gross indiscipline.
- iv. Commensurate with the gravity of the offence, the punishment may be reprimand, fine, and expulsion from the hostel, debarment from an examination, rustication for a specified period or even outright expulsion from the College.
- v. The reprimanding Authority for an offence committed by students in the Hostels and in the Department or the classroom shall be respectively, the manager of the Hostels and the Head of the concerned Department.
- vi. In all the cases of offence committed by students in jurisdictions outside the purview of Clause (12.v), the Principal shall be the Authority to reprimand them.
- vii. All major acts of indiscipline involving punishment other than mere reprimand, shall be considered and decided by the Principal, Students Disciplinary Committee appointed by the Principal.
- viii. All other cases of indiscipline of students, like adoption of unfair means in the examinations shall be reported to the Vice-Principal, for taking appropriate action and deciding on the punishment to be levied.
- ix. In all the cases of punishment levied on the students for any offence committed, the aggrieved party shall have the right to appeal to the Principal, who shall constitute appropriate Committees to review the case.

13. With-holding of Results:

If the candidate has any dues not paid to the college or if any case of indiscipline or malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

14. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.5 < 5.5$

14. Minimum Instruction Days:

The minimum instruction days including exams for each semester shall be for 90 days.

15. There shall be no branch transfers after the completion of admission process.

16. There shall be no place transfer within the Constituent Colleges.

17. Punishments for Malpractice Cases - Guidelines

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

S. No	Nature of Malpractices/Improper conduct	Punishment
1.	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 student 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.
2.	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.
3.	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.
4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student 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 students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
5.	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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
6.	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 including practical examinations and project work of that semester/year.

7.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Refuses to obey the orders of the Chief Inspector/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 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.	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 of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
9.	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 including practical examinations and project work 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.
10.	Possesses 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 including practical examinations And project work of that semester/year. The student is also debarred and forfeits the seat.

11.	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 7 to 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work 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.
12.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination including practical's and project work of that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat
13.	If any malpractice is detected which is not covered in the above clauses 1 to 12 it shall be reported to the college academic council for further action to award suitable punishment.	
14.	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

18. General:

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- ii. Malpractice rules - nature and punishments is appended
- iii. Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
- v. The College may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on roles with effect from the dates notified by the College.



Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu–515 002 (A.P) India

Academic Regulations (R19) for B. Tech. (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year
2019-2020 onwards)

and

Academic Regulations (R19) for B.Tech.(Lateral Entry Scheme)

(Effective for the students getting admitted into II year through Lateral Entry
Scheme from the Academic Year **2020-2021** onwards)

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

- i A student has to pursue a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would not be counted in the maximum period permitted for graduation.
 - ii A student has to register for 160 credits and secure all 160 credits to get B.Tech. degree
 - iii A student will be eligible to get B.Tech. degree with Honours or a Minor if he/she completes an additional 20 credits.
 - iv A student will be permitted to register either for Honours or a Minor Engineering but not both.
2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

3. Programs offered by the University:

The following programs are offered at present as specializations for the B. Tech. course for non-autonomous, constituent & affiliated colleges from 2019-2020.

S.No.	Name of the Program	Program Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Information Technology	12
7.	Food Technology	27

and any other course as approved by the authorities of the University from time to time.

4. About Program related terms:

- i **Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.
- ii **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- iii **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses.

- iv Each course is assigned certain number of credits based on following criterion:

	Semester	
	Periods / Week	Credits
Theory (Lecture/Tutorial)	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02

5. Weights for Course Evaluation:

5.1 Course Pattern:

- The entire course of study is for four academic years. Semester pattern shall be followed in all the academic years
- A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

5.2 Evaluation Process:

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Socially relevant project and Internship shall be evaluated for 50 marks each & Project work shall be evaluated for 200 marks whereas mandatory courses with no credits shall be evaluated for 30 mid semester marks.

- For theory subjects the distribution shall be 30 marks for mid semester Evaluation and 70 marks for the End-Examination.
- For practical subjects, the distribution shall be 30 marks for mid semester Evaluation and 70 marks for the End- Examination.
- If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

5.3 Internal Evaluation:

For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for continuous evaluation in the form of assignments.

Objective paper shall be set for maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of question. Each question carries 5 marks.

***Note 1:** The subjective paper shall contain 6 questions of equal weightage of 5 marks. Any fraction (0.5 & above) shall be rounded off to the next higher mark.

***Note 2:** The Objective paper shall be conducted online by the college on the day of subjective paper test.

***Note 3:** Five assignments shall be given and evaluated.

If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25

Marks obtained in second mid: 20

Final mid semester Marks: $(25 \times 0.8) + (20 \times 0.2) = 24$

If the student is absent for any one midterm examination, the final mid semester mark shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first mid: Absent

Marks obtained in second mid: 25

Final mid semester Marks: $(25 \times 0.8) + (0 \times 0.2) = 20$

5.4 **End Examination Evaluation:**

- i. End examination of theory subjects shall have the following pattern:
 - a) There shall be 6 questions and all questions are compulsory.
 - b) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be two short answer questions from each unit.

- c) In each of the questions from 2 to 6, there shall be either/or type questions of 10marks each. Student shall answer any one of them.
 - d) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.
 - ii. End examination of theory subjects consisting of two parts of different subjects, for Example: Electrical & Mechanical Technology shall have the following pattern:
 - a) Question paper shall be in two parts viz., Part A and Part B with equal weightage.
 - b) In each part, there shall be 3 either-or type questions for 12,12 and 11 marks.
- 5.5 For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the laboratory shall be evaluated for 30 marks by the concerned laboratory teacher based on the regularity/record/viva/mid semester test. The end examination shall be conducted by the concerned laboratory teacher and a senior expert in the subject from the same department. In a practical subject consisting of two parts (Ex: Electrical & Mechanical Engineering Lab), the end examination shall be conducted for 35 marks in each part. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.
- 5.6 There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the audit course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examination. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.
- 5.7 For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The

sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing is mentioned along with the syllabus.

- 5.8 Laboratory marks and the sessional marks awarded by the college are not final. They are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the college will be referred to a committee. The committee will arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding.
- 5.9 The laboratory records and mid semester test papers shall be preserved for a minimum of 2 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.
- 5.10 **Choice Based Credit Courses (CBCC):**
There shall be four professional elective courses, four open elective courses and two humanities elective courses, which are Choice Based Credit Courses (CBCC), offered from V semester onwards. Among them, professional elective course offered in VI semester shall be pursued through MOOCs. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. In case, if student does not pass subject registered through SWAYAM/NPTEL, the University shall conduct the external examination for the MOOC subject for 100 marks based on the syllabi of the respective subject provided in the curriculum.
- 5.11 **Minor degree in a discipline(Minor degree/programme):**
This concept is introduced in the curriculum of all conventional B.Tech. programoffering a major degree. The main objective of Minor in a discipline is to provideadditional learning opportunities for academically motivated students and it is optionalfeature of the B. Tech. program. To earn a Minor in a discipline a student must earn 20 extra credits by studying five theory subjects for 15 credits with 3 credits each from the program core & professional elective course, as decided by the respective Board of Studies, of the minor discipline and a Project (Minor) for 5 credits.

Student may register for the Project (Minor) from V semester onwards and complete the same before VIII semester. Out of total 100 marks for the **Project (Minor)**, 30 marks shall be for Internal Evaluation and 70 marks for the End Semester Examination (Viva-voce). The Viva-Voce shall be conducted by a committee consisting of HOD, Project Supervisor and an External Examiner nominated by the University. The evaluation of project work shall be conducted at the end of the VIII semester. The Internal Evaluation shall be made by the departmental committee (Head of the Department and one senior faculty member of the Department and Supervisor).

- i Students having a CGPA of 8.0 (for SC/ST students CGPA of 7.5) or above up to II year-I semester and without any backlog subjects will be permitted to register for Minor discipline programme. An SGPA and CGPA of 7.5 (for SC/ST students CGPA of 7.0) must be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor discipline registration live or else it will be cancelled.
- ii Students aspiring for a Minor must register from V semester onwards and must opt for a Minor in a discipline other than the discipline he/she is registered in. However, Minor discipline registrations are not allowed before V semester and after VI semester.
- iii Students will not be allowed to register and pursue more than two subjects in any semester.
- iv The Evaluation pattern of theory subjects shall be similar to the regular programme evaluation.
- v Minimum strength required for offering a **Minor in a** discipline is considered as 20% of the class size and there shall be no limit on maximum strength.
- vi Completion of a Minor discipline programme requires no addition of time to the regular Four-year Bachelors' programme. That is, Minor discipline programme should be completed by the end of final year B. Tech. program along with the major discipline.
- vii The Concerned Principal of the college shall arrange separate course/class work and timetable of the various Minor programmes. Attendance regulations for these Minor discipline programmes will be as per regular courses.
- viii A student registered for Minor in a discipline shall pass in all subjects that constitute the requirement for the Minor degree programme. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Minor degree programme.
- ix The Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in Mechanical Engineering with Minor in Computer Science. This fact will also be reflected in the transcripts, along

with the list of courses taken for Minor programme with CGPA mentioned separately.

5.12 **Honours degree in a discipline:**

This concept is introduced in the curriculum for all conventional B. Tech. programmes. The main objective of Honours degree in a discipline is to provide additional learning opportunities for academically motivated students, and it is an optional feature of the B. Tech. programme. To earn an Honours degree in his/her discipline, a student has to earn 20 extra credits by studying five courses with 4 credits each. The Evaluation pattern of theory subjects will be similar to the regular programme evaluation.

Students aspiring for Honours degree must register from V semester onwards. However, Honours degree registrations are not allowed before V semester and after VI semester.

- i Students having a CGPA of 8.0 (for SC/ST students CGPA of 7.5) or above up to II year-I semester and without any backlog subjects will be permitted to register for degree with Honours. An SGPA and CGPA of 7.5 (for SC/ST students CGPA of 7.0) has to be maintained in the subsequent semesters without any backlog subjects in order to keep the degree with Honours registration live or else it will be cancelled.
- ii Students aspiring for Honours must register from V semester onwards, and must opt for Honours in a discipline he/she is registered in. However, Honours registrations are not allowed before V semester and after VI semester.
- iii Students will not be allowed to register and pursue more than two subjects in any semester.
- iv The Evaluation pattern of theory subjects shall be similar to the regular programme evaluation.
- v Minimum strength required for offering Honours in a discipline is considered as 20% of the class size and there shall be no limit on maximum strength.
- vi Completion of Honours requires no addition of time to the regular Four-year Bachelors' programme. That is, Honours should be completed by the end of final year B. Tech. program along with the major discipline.
- vii The Head of the concerned department shall arrange separate course/class work and timetable for Honours. Attendance regulations for Honours will be as per regular courses.
- viii A student registered for Honours shall pass in all subjects that constitute the requirement for the Honours degree programme. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honours degree programme.
- ix The Honours will be mentioned in the degree certificate as Bachelor of Technology (Honours) in XXX. For example, Bachelor of Technology

(Honours) in Mechanical Engineering. This fact will also be reflected in the transcripts, along with the list of courses taken for Honours programme with CGPA mentioned separately.

- 5.13 A **Socially relevant Project** is introduced in V & VI semesters for 0.5 credits in each semester. The student shall spend 15 Hrs./semester on any socially relevant project and submit a report for evaluation. This shall be evaluated for 50 marks in each of the above semesters by a committee consisting of Head of the department, Project mentor and one senior faculty member of the department. A student shall acquire 0.5 credits assigned, when he/she secures 40% or more marks for the total of 50 marks. In case, if a student fails, he/she shall resubmit the report. There shall be no external evaluation.
- 5.14 There shall be one Comprehensive online examination with **zero credits** conducted by the college at the end of VI semester with 100 objective questions for 100 marks on the subjects studied up to VI semester. Student shall be declared to have passed the Comprehensive online examination only when he/she secures 40% or more marks in the examination. In case, the student fails, reexam shall be conducted in a month. If the student is unable to secure 40% marks in reexam, then he/she shall reappear as and when VI semester supplementary examinations are conducted.
- 5.15 **Internship/Industrial Training/Research Projects in National Laboratories/ Academic Institutions:**
An Internship/Industrial Training/Research Projects in National Laboratories/Academic Institutions in physical or virtual mode is introduced for 2 credits in the curriculum. It is introduced at the end of VI semester i.e., during summer vacation for a period of 4 weeks. The student shall submit a diary and a technical report for evaluation. This shall be evaluated in the VII semester for 50 marks by a committee consisting of Head of the Department along with two senior faculty members of the department. A student shall acquire 2 credits assigned, when he/she secures 40% or more marks for the total of 50 marks. In case, if a student fails, he/she shall reappear as and when the VII semester supplementary examinations are conducted. There shall be no external evaluation.
- 5.16 **Procedure for Conduct and Evaluation of Project Work:**
There shall be a presentation of **Abstract of the main project** in the VII Semester. After selecting the specific topic, the student shall collect the information and prepare a report, showing his/her understanding of the topic and submit the same to the department before presentation. The students start working on selected topic immediately after VII semester examinations.
Out of a total of 200 marks for the Project Work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination (Viva-voce). The Viva-Voce shall be conducted by a committee consisting of HOD, Project

Supervisor and an External Examiner nominated by the University. Project work shall start in VII semester and shall continue in the VIII semester. The evaluation of project work shall be conducted at the end of the VIII semester. The Internal Evaluation shall be made by the departmental committee (Head of the Department, two senior faculty members of the department and Supervisor), based on two seminars given by each student on the topic of his/her project.

6. Attendance Requirements in Academics:

- 6.1 A student shall be eligible to appear for university examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- 6.2 Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- 6.3 Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- 6.4 A stipulated fee shall be payable towards condonation of shortage of attendance to the University.
- 6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- 6.6 A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek re-admission for that semester when offered next.

7. Minimum Academic Requirements and Award of the Degree:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in section 6.

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together. In case of mandatory courses he/she should secure 40% of the total marks.
- ii. A student shall be promoted from IV to V Semester only if he/she fulfils the academic requirement of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to III semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and two supplementary examinations of I Semester
One regular and one supplementary examination of II Semester
One regular examination of III semester.

- iii. A student shall be promoted from VI semester to VII semester only if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and four supplementary examinations of I Semester.
One regular and three supplementary examinations of II Semester.
One regular and two supplementary examinations of III Semester.
One regular and one supplementary examination of IV Semester.
One regular examination of V Semester.

And in case a student is detained for want of credits for particular academic year by sections ii and iii above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester as the case may be.

- iv. A student shall register and put-up minimum attendance in all 160 credits and earn all the 160 credits.
- v. Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

8. With-holding of Results:

If the candidate has any dues not paid to the university or if any case of indiscipline or malpractice is pending against him/her or candidate or student, the result of the candidate shall be withheld, and the candidate will not be allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

9. Award of Grades:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

- i. A student obtaining Grade ‘F’ or Grade ‘Ab’ in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
- ii. For mandatory courses, “Satisfactory” or “Unsatisfactory” shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \Sigma (C_i \times G_i) / \Sigma C_i$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

- ii The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma (C_i \times S_i) / \Sigma C_i$$

where “ S_i ” is the SGPA of the i^{th} semester and C_i is the total number of credits upto that semester.

- iii Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course.

Grades are denoted by letters S, A, B, C, D, E and F.

10. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree he/she shall be placed in one of the following four classes

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

11. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The Principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

12. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or 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, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

13. Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 days.

14. Medium of Instruction:

The Medium of Instruction is **English** for all courses, laboratories, mid semester and external examinations, Comprehensive Viva-Voce, seminar presentations and project reports.

15. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the University from time to time.

16. General Instructions:

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- i. Malpractices rules-nature and punishments are appended.
- ii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- iv. The University may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the University.

ACADEMIC REGULATIONS (R19)
FOR B.TECH. (LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2020-2021 onwards)

1. Award of B.Tech. Degree

A student admitted in Lateral Entry Scheme (LES) will be declared eligible for the award of the B.Tech degree if the student fulfils the following academic regulations:

- i. Pursues a course of study for not less than three academic years and not more than six academic years.
 - ii. Registers for 120.5 credits and secures all 120.5 credits from II to IV year of Regular B. Tech. program.
2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.
3. The regulations 3 to 6 except 5.1 are to be adopted as that of B. Tech. (Regular).

4. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.
- ii. A student shall be promoted from third year to fourth year only if the student fulfils the academic requirements of securing 40% of credits (any **decimal** fraction should be **rounded off** to **lower** digit) from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.
One regular and two supplementary examinations of III semester.
One regular and one supplementary examination of IV semester.
One regular examination of V semester.

And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

5. Course Pattern

- 5.1 The entire course of study is three academic years on semester pattern.
 - 5.2 A student eligible to appear for the end examination in a subject but absent at the end examination has failed in the end examination may appear for that subject at the next supplementary examination offered.
 - 5.3 When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.
6. The regulations 8 to 16 are to be adopted as that of B. Tech. (Regular). All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
7. There shall be two mandatory courses with **zero credits**: English in III semester, Mathematics in IV semester. There shall be no external examination for these mandatory courses. However, attendance in the mandatory course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the mid semester examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
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 for four 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. 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 four consecutive semesters from class work and all University examinations, if his involvement is established. Otherwise, the candidate is 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 only.
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 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.	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. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. 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 only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
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.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
3. A show cause notice shall be issued to the college.
4. Impose a suitable fine on the college.
5. Shifting the examination centre from the college to another college for a specific period of not less than one year.

Note:-

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfil all the norms required for the award of Degree.

RULES FOR

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
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 for four 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. 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 four consecutive semesters from class work and all University examinations, if his involvement is established. Otherwise, the candidate is 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.

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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 only.
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 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.	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. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. In case of outsiders, they will be handed over to the police and a police case is registered against them.
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		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.
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**JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) ANANTAPUR
ANANTHAPURAMU-515 002 (A.P) INDIA**

**Academic Regulations (R20) for
B. Tech (Regular-Full time)**

(Effective for the students admitted into 1 year from the Academic Year 2020-2021 onwards)

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfills the following academic regulations:

- i. Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would be in addition to the maximum period permitted for graduation (Eight years).
- ii. Registers for 160 credits and secures all 160 credits.
- iii. A student will be eligible to get Undergraduate degree with Honors or additional Minor chosen degree in Engineering, if he/she completes an additional 20 credits for each.
- iv. A student will be permitted to register for either Honors degree or additional Minor degree in Engineering.

2. Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. Course and their admission stands cancelled. This clause shall be read along with clause 1 (i).

3. Programmes offered by the College:

The following Programmes are offered at present as specializations for the B. Tech. course from 2020-21

S.No.	Name of the Programme	Programme Code
1.	Civil Engineering	01
2.	Electrical and Electronics Engineering	02
3.	Mechanical Engineering	03
4.	Electronics and Communication Engineering	04
5.	Computer Science and Engineering	05
6.	Chemical Engineering	08

4. Admissions:

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by

the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

5. Programme related terms:

- i. **Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.
- ii. **Academic Year :** Two consecutive (one odd + one even) semesters constitute one academic year.
- iii. **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the Prescribed courses.
- iv. Each course is assigned certain number of credits based on following criterion:

	Semester	
	Hours/ Week	Credits
Theory (Lecture/Tutorial)	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02

6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S. No.	Category	Code	Breakup of Credits (Total 160)
1	Humanities and Social Science including Management courses	HS	10.5
2	Basic Science courses	BS	21
3	Engineering Science Courses	ES	24
4	Professional Core Courses	PC	51
5	Professional Elective Courses	PE	15
6	Open Elective Courses	OE	12
7	Skill Oriented/Advanced Courses	SC	10
8	Internship, Project work	PR	16.5
9	Non-credit Mandatory Courses	MC	0

7. Program Pattern

- i. Total duration of the of B. Tech (Regular) Programme is four academic years
- ii. Each academic year of study is divided into two semesters.
- iii. Minimum number of instruction days in each semester is 90.
- iv. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
- v. All undergraduate students shall register for NCC/NSS/ activities. A student will be required to participate in an activity for two hours in a week either in third or fourth semester. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet based on participation, attendance, performance, and

behaviour. If a student gets an unsatisfactory grade, he/she shall repeat the above activity in the subsequent years, to complete the degree requirements

vi. Courses like Environmental Sciences, Universal Human Values, Indian Constitution, Design Thinking for Innovation and Employability Skills is offered as non-credit mandatory courses for all branches.

vii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.

viii. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in an emerging area within the chosen field of study.

ix. Student can opt for any open elective other than open elective offered by his/her own department. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to that of their departmental core/elective courses.

x. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.

xi. Students shall undergo mandatory summer internships, for a minimum of six weeks duration at the end of second and third year of the programme. There shall also be mandatory full internship in the final semester of the programme along with the project work.

xii. Undergraduate degree either with Honours or a Minor is introduced by the College for the students having good academic record

xiii. Each department shall take measures to implement Virtual Labs (<https://www.vlab.co.in>) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xiv. Each department shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration / career growth / placements / opportunities for higher studies / GATE / other competitive exams etc.

xv. Preferably 25% course work for the theory courses in every semester shall be conducted in the blended mode of learning.

8. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks each, Full Internship & Project work in final semester shall be evaluated for 200 marks whereas mandatory courses with no credits shall be evaluated for 30 mid semester marks.

- i. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.
- ii. For practical subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
- iii. If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B).
- iv. If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

8.1. Midterm Examination Evaluation:

- i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper with 20 objective type questions (20 minutes duration), 15 marks for subjective paper (90 minutes duration) with 3 either or type questions (totally 6 questions from 1 to 6) of which student has to answer one from each either or type question and 5 marks for assignment.

***Note 1:** The objective paper with 20 objective type questions shall be prepared in line with the quality of UPSC/ GATE examination questions.

***Note 2:** The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. Any fraction shall be rounded off to the next higher mark.

***Note 3:** The midterm examination shall be conducted first by distribution of the Objective paper, simultaneously marking the attendance, after 20 minutes the answered objective paper shall be collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are collected back.

***Note 4:** The assignment shall contain objective type/essay type question/numerical problems/software development. It should be continuous assessment throughout the semester. There shall be at least two assignments in a semester and the average marks of the two assignments shall be considered.

- ii) If the student is absent for the internal examination, no re-exam shall be conducted and internal marks for that examination shall be considered as zero.

- iii) First midterm examination shall be conducted for I, II and half part of the III units of syllabus. The second midterm examination shall be conducted for remaining part of III, IV and V units.

- iv) Final midterm marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25

Marks obtained in second mid: 20

Final Internal Marks: $(25 \times 0.8) + (20 \times 0.2) = 24$

If the student is absent for any one midterm examination, the final internal marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent

Marks obtained in second mid: 25

Final Internal Marks: $(25 \times 0.8) + (0 \times 0.2) = 20$

8.2. End Examination Evaluation:

- i) End examination of theory subjects shall have the following pattern:

- There shall be 6 questions and all questions are compulsory.
- Question 1 shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be two short answer questions from each unit. The questions shall be in line with quality of UPSC/GATE examination.

- c. In each of the questions from 2 to 6 (2 to 11 in s.no. wise), there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
- d. The questions from 2 to 6 shall be set by covering one either or type question from each unit of the syllabus.

ii) End examination of theory subjects consisting of two parts of different subjects, for Example:

Electrical & Mechanical Technology shall have the following pattern:

- a. Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- b. In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
- c. In each part, questions from 2 to 7, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

Note: The answers for Part A and Part B shall be written in two separate answer books.

iii) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test. The end examination shall be conducted by the concerned laboratory teacher and a senior expert in the subject from the same department. For passing the laboratory examination a student shall obtain minimum 35% marks in the external examination and shall obtain minimum 40% including internal and external examinations.

iv) In a practical subject consisting of two parts (Eg: Electrical & Mechanical Engg. Lab), the end examination shall be conducted for 35 marks in each part. Internal marks shall be evaluated for 15 marks in each part. Minimum of 35% of lab in each part in the end exam. i.e., 12 for each and overall student shall obtain minimum 40% including internal and external evaluation.

v) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for internal evaluation and 70 for end examination.

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper (Midterm examination) shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in midterm examination. The sum of day-to-day evaluation and the internal test marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing is to be mentioned along with the syllabus.

vi) There shall be no external examination for mandatory courses with zero credits. However, attendance in the audit course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

vii) The midterm test papers and lab records shall be preserved for a minimum of 3 years in the respective departments as per the Institution norms and shall be produced to the Committees as and when the same are asked for.

9. Skill Oriented Courses

- i) There shall be five skill-oriented courses offered during III to VII semesters.
- ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.
- f) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 15 marks by the concerned teacher based on the regularity/assignments/viva and remaining 15 marks through mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.
- iii) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
- iv) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.
- v) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the College at the beginning of the semester.
- vi) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the College.

10. Choice Based Credit Courses (CBCC)

There shall be four open elective courses, five professional elective courses and two humanities elective courses which are **Choice Based Credit Courses (CBCC)** from III semester onwards. Among them, professional elective course offered in VI semester shall be pursued in MOOC manner. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. In case, if student does not pass subject registered through SWAYAM/NPTEL, the College shall conduct the external examination for the MOOC subject for 100 marks based on the syllabi of the respective subject provided in the curriculum.

11. Credit Transfer Policy

- a) As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, a 'Gazette Notification' issued on 19th July 2016 & 17th August 2016,

respectively, the University shall allow up to 20% of the total courses being offered in a particular Programme in a semester through the Online Learning courses through SWAYAM.

- i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform.
- ii) The online learning courses available on the SWAYAM platform will be considered for credit transfer.
- iii) Student registration for the MOOCs shall be only through the institution, it will be mandatory for the student to share necessary information with the institution.
- iv) Credit transfer policy will be applicable to the Skill courses, Elective courses (Professional, Open & Humanities) offered by the university under Choice Based Credit System (CBCS).
- v) The institution shall select the courses to be permitted for credit transfer through SWAYAM. However, while selecting courses in the online platform institution would essentially avoid the courses offered through the curriculum in the offline mode.
- vi) The institution shall notify in June and November every year the list of the online learning courses eligible for credit transfer in the forthcoming Semester.
- vii) The heads of the departments shall also ensure that the student has to complete the course and produce the course completion certificate as per the academic schedule given for the regular courses in that semester
- viii) SWAYAM Course credit points are as specified in the platform
- ix) The head of the department shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
- x) The college shall ensure no overlap of SWAYAM MOOC exams with that of the college examination schedule. In case of delay in SWAYAM results, the college will re-issue the marks sheet for such students.
- xi) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks/grades.
- xii) The departments shall submit the following to the examination section of the college:
 - a) List of students who have passed MOOC courses in the current semester along with the certificates of completion.
 - b) Undertaking form filled by the students for credit transfer.
- xiii) The college shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

b) Students shall also be permitted to take online courses through other MOOC platforms like Coursera, edX, Udemy etc. as per the guidelines specified in a). Only the courses with evaluation specified in percentage/grades shall be considered. If not specified in the online platform, then following credit equivalence shall be considered:

- Courses of 8 weeks duration: 2 Credits
- Courses of 10 weeks duration: 3 Credits
- Courses 12 weeks duration: 4 Credits

12. Mandatory Internships

a) Summer Internships:

Two summer internships either onsite or virtual each with a minimum of six weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Hydel and thermal power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships shall be society oriented and shall be completed in collaboration with government

organizations/NGOs & others. The student shall register for the internship as per course structure after commencement of academic year.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages, respectively. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the college.

b) Full Semester Internship and Project work:

In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks based on Motivation, Technical Knowledge and Awareness related to the Project. At the end of the semester, it is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the college and is evaluated for 140 marks.

The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

13. Minor degree in a discipline(Minor degree/Programme):

- This concept is introduced in the curriculum of all conventional B. Tech. Programmes offering a major degree. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. Programme. A student can get a Minor degree in a discipline other than his/her parent discipline if he/she earn 20 extra credits from the discipline in which he/she wants to acquire Minor degree through professional core/professional elective or equivalent MOOC courses pertaining to the discipline in which Minor degree is needed, available under SWAYAM platform. The list of courses to be studied either in MOOCs or conventional type will be decided by the College at the time of registration for Minor degree.
- a. Students having a CGPA of 8.0(for SC/ST students CGPA of 7.5) or above up to II year-I semester and without any backlog subjects will be permitted to register for Minor degree. An SGPA and CGPA of 7.5 (for SC/ST students CGPA of 7.0)has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor discipline registration live or else it will be cancelled.
- b. Students aspiring for a Minor degree must register from V semester onwards and must opt for a Minor degree in a discipline other than the discipline he/she is registered in. However, Minor discipline registrations are not allowed before V semester and after VI semester.
- c. Students will not be allowed to register and pursue more than two subjects in any semester.
- d. The Evaluation pattern of theory subjects will be similar to the regular Programme evaluation.
- e. Students may enlist their choice of Minor discipline Programmes, in order of preference, for which they wish to register. It will not be permissible to alter the choices after the application has been submitted. However, students are allowed to opt for only one Minor discipline Programme in the

order of preference given by them.

- f. Minimum strength required for offering a Minor in a discipline is considered as 20% of the class size and Maximum would be 80% of the class size.
- g. Completion of a Minor discipline Programme requires no addition of time to the regular Four year Bachelors' Programme. That is, Minor discipline Programme should be completed by the end of final year B. Tech. Programme along with the major discipline.
- h. There shall be separate course/class work and time table of the various Minor Programmes. Attendance regulations for these Minor discipline Programmes will be as per regular courses.
- i. A student registered for Minor in a discipline shall pass in all subjects that constitute the requirement for the Minor degree Programme. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Minor degree Programme.
- j. Five courses of the pattern (3-0-2) or (3-1-0) have to be studied.
- k. The Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in **Computer Science & Engineering** with Minor in **Electronics & Communication Engineering**. This fact will also be reflected in the transcripts, along with the list of courses taken for Minor Programme with CGPA mentioned separately.
- l. There shall be no limit on the number of minor programs to be offered. BOS can identify as many as no. of tracks.
- m. If the student drops (or terminated) from the minor program, the earned credits cannot be converted into core electives and they will appear as extra credits in the marks sheet.

14. Honors degree in a discipline:

- a. This concept is introduced in the curriculum for all conventional B. Tech. Programmes. The main objective of Honors degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. Programme. In order to earn a Honors degree in his/her discipline, a student has to earn 20 extra credits by studying five advanced courses of (3-0-2) in the concerned branch of Engineering. In place of advanced courses, he/she can study equivalent MOOC courses available under SWAYAM platform, as decided by the College from time to time. The Evaluation pattern of theory subjects will be similar to the regular Programme evaluation. Students aspiring for Honors degree must register from V semester onwards. However, Honors degree registrations are not allowed before V semester and after VI semester.
- b. Minimum strength required for offering a Honor in a discipline is considered as 5% of the class size
- c. Students having a CGPA of 8.0 (for SC/ST students CGPA of 7.5) or above up to II year-I semester and without any backlog subjects will be permitted to register for degree with Honors. An SGPA and CGPA of 7.5 (for SC/ST students CGPA of 7.0) has to be maintained in the subsequent semesters without any backlog subjects in order to keep the degree with Honors registration live or else it will be cancelled and degree will be given as B.Tech. (Regular).
- d. Students are allowed to register either Minor or Honor degree only. No student will be allowed to register both.
- e. If the student drops (or terminated) from the honor program, the earned credits cannot be converted into core electives and they will appear as extra credits in the marks sheet.

15. Attendance Requirements in Academics:

- i) A student shall be eligible to appear for external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects
- ii) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- iii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- iv) A stipulated fee shall be payable towards condonation of shortage of attendance to the Institution.
- v) Students whose shortage of attendance is not condoned in any semester are not eligible to take their

end examination of that class and their registration shall stand cancelled.

vi) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.

vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.

viii) For Induction programme attendance shall be maintained as per the AICTE norms.

16. Promotion Rules

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in section 15.

i) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks (Sum of Internal and External Marks). In case of mandatory courses he/she should secure 40% of the total marks.

ii) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per college norms.

iii) A student shall be promoted from IV to V Semester only if he/she fulfils the academic requirement of securing 40% (any decimal fraction should be rounded off to lower digit) of the credits in the subjects that have been studied up to III semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and two supplementary examinations of I Semester.

One regular and one supplementary examination of II Semester.

One regular examination of III semester.

iv) A student shall be promoted from VI semester to VII semester only if he/she fulfils the academic requirements of securing 40% (any decimal fraction should be rounded off to lower digit) of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and four supplementary examinations of I Semester.

One regular and three supplementary examinations of II Semester.

One regular and two supplementary examinations of III Semester.

One regular and one supplementary examinations of IV Semester.

One regular examination of V Semester.

And in case a student is detained for want of credits for particular academic year by sections iii) and iv) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester as the case may be.

v) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

vi) A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits.

vii) Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled, subjected to clause 1(i).

17. With-holding of Results:

If the candidate has any dues not paid to the College or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and the candidate will not be allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

18. Gap Year Concept:

- Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I/II/III year to pursue full-time entrepreneurship.
- This period may be extended to two years at most and these two years would be in addition to the maximum period permitted for graduation.
- The Principal of the college shall take the decision on proposals submitted by the students. An evaluation committee constituted by the Principal of the College shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

19. Transitory Regulations:

- Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfillment of academic regulations.
- Candidates who have been detained for want of attendance or 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, subject to Section 2 and they will follow the academic regulations into which they are readmitted.
- Candidates who are permitted to avail Gap Year shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

20 . Minimum Instruction Days for a Semester:

The minimum instruction days including exams for each semester shall be 90 working days.

21. Medium of Instruction:

The Medium of Instruction is **English** for all courses, laboratories, internal and external examinations, Comprehensive Viva-Voce, seminar presentations and project reports.

22. Student Transfers:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the University from time to time.

23. Award of Grades:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
≥ 90	A+ (Outstanding)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Fair)	6
40-49	E (Satisfactory)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

- A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.
- For mandatory courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

24. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

- The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a Programme, i.e.,

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where " S_i " is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.
- Grade Point*: It is a numerical weight allotted to each letter grade on a 10-point scale.
- Letter Grade*: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.
- As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:
Equivalent Percentage = (CGPA - 0.50) x 10

25. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the Programme and is eligible for the award of B. Tech. degree he/she shall be placed in one of the following:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

26. General Instructions:

- a. The academic regulations should be read as a whole for purpose of any interpretation.
- b. Malpractices rules-nature and punishments are appended.
- c. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
- e. The Principal may change or amend the academic regulations of common B.o.S or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Principal.
- f. The above rules and regulations are to be approved/ratified by the College Academic Council as and when any modifications are to be done.

ACADEMIC REGULATIONS FOR B. TECH.(R20)
(LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2021-2022 and onwards)

1. Award of B.Tech. Degree

A student admitted in Lateral Entry Scheme (LES) will be declared eligible for the award of the B.Tech degree if the student fulfills the following academic regulations:

- a) Pursues a course of study for not less than three academic years and not more than six academic years.
 - b) Registers for 121 credits and secures all 121 credits from II to IV year of Regular B.Tech. Programme.
- 2.** Students, who fail to fulfill the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.
- 3.** The regulations **3** to **6** except 5.1 are to be adopted as that of B. Tech. (Regular).

4. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.
- ii. A student shall be promoted from third year to fourth year only if the student fulfills the academic requirements of securing 40% of credits from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.
 - a. One regular and Two supplementary examinations of III semester.
 - b. One regular and one supplementary examinations of IV semester.
 - c. One regular examination of V semester.

And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

5.Course Pattern

- 5.1. The entire course of study is three academic years on semester pattern.
- 5.2. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.
- 5.3. When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfillment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

6. The regulations **8** to **16** are to be adopted as that of B. Tech. (Regular). All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

7. Minimum Academic Requirements and Award of the Degree:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in section 6 of B.Tech. (Regular).

7.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal and end examination marks taken together. In case of mandatory courses he/she should secure 40% of the total marks.

7.2 A lateral entry student shall be promoted from VI semester to VII semester only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and two supplementary examinations of III Semester.

One regular and one supplementary examinations of IV Semester.

One regular examination of V Semester.

And in case a student is detained for want of credits for particular academic year by section 7.2 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the VII semester as the case may be.

**RULES FOR
DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN
EXAMINATIONS**

S. No.	Nature of Malpractices/Improper conduct	Punishment
	<i>If the Candidate:</i>	
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.
1 (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.
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 for four consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of 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 four consecutive semesters from class work and all examinations, if his involvement is established. Otherwise, the candidate is debarred for two consecutive semesters from class work and all 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 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 only.
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 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.	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. If the candidate physically assaults the invigilator/ officer-in-charge of the Examinations, then the candidate is also debarred and forfeits his/her seat. 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 there of 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 the 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	Expulsion from the examination hall and

	in the examination hall.	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 only or in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester / year examinations, depending on the recommendation of the committee.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Institution for further action to award suitable punishment.	

Note: -

Whenever the performance of a student is cancelled in any subject/subjects due to Malpractice, he has to register for End Examinations in that subject/subjects consequently and has to fulfill all the norms required for the award of Degree.



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ANANTHAPURAMU – 515 002 (A.P) INDIA

M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

SEMESTER – I

S. No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D58101	Advanced Data Structures and Algorithms	PC	3	0	0	3
2.	21D58102	Advanced Computer Networks	PC	3	0	0	3
3.	21D58103a 21D58103b 21D5813c	Program Elective Course - I Machine Learning Object Oriented Software Engineering Digital Image & Video Processing	PE	3	0	0	3
4.	21D58104a 21D58104b 21D58104c	Program Elective Course - II Data Science Design Patterns Information Security	PE	3	0	0	3
5.	21D58105	Advanced Data Structures and Algorithms Lab	PC	0	0	4	2
6.	21D58106	Advanced Computer Networks Lab	PC	0	0	4	2
7.	21DRM101	Research Methodology and IPR	MC	2	0	0	2
8.	21DAC101a 21DAC101b 21DAC101c	Audit Course – I English for Research paper writing Disaster Management Sanskrit for Technical Knowledge	AC	2	0	0	0
Total							18



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI
SEMESTER – II

S.No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D58201	Advanced Operating Systems	PC	3	0	0	3
2.	21D58202	Internet of Things	PC	3	0	0	3
3.	21D58203a 21D58203b 21D58203c	Program Elective Course – III Deep Learning Service Oriented Architecture Computer Vision	PE	3	0	0	3
4.	21D58204a 21D58204b 21D58204c	Program Elective Course - IV Data Visualization Techniques Distributed Systems Privacy Preserving Data Publishing	PE	3	0	0	3
5.	21D58205	Advanced Operating Systems Lab	PC	0	0	4	2
6.	21D58206	Internet of Things Lab	PC	0	0	4	2
7.	21D35207	Technical seminar	PR	0	0	4	2
8.	21DAC201a 21DAC201b 21DAC201c	Audit Course – II Pedagogy Studies Stress Management for Yoga Personality Development through Life Enlightenment Skills	AC	2	0	0	0
Total							18



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

SEMSTER - III

S.No.	Course codes	Course Name	Category	Hours per week			Credits
				L	T	P	
1.	21D58301a 21D58301b 21D58301c	Program Elective Course – V Software Defined Networks Reinforcement Learning Data Analytics	PE	3	0	0	3
2.	21DOE301b 21DOE301c 21DOE301f	Open Elective Industrial Safety Business Analytics Optimization Techniques	OE	3	0	0	3
3.	21D58302	Dissertation Phase – I	PR	0	0	20	10
4.	21D58303	Co-curricular Activities					2
		Total					18

SEMESTER - IV

S.No.	Course codes	Course Name	Category	Hours per			Credits
				L	T	P	
1.	21D58401	Dissertation Phase – II	PR	0	0	32	16
		Total					16



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED DATA STRUCTURES AND ALGORITHMS (Common to M.Tech CSE, CN, SE, AI & ML)	L	T	P	C
21D58101		3	0	0	3
Semester		I			
Course Objectives:					
- To understand concepts of dictionaries and hash tables. - To implement lists and trees. - To analyze usage of B trees, Splay trees and 2-3 trees. - To understand the importance of text processing and computational Geometry.					
Course Outcomes (CO): Student will be able to					
- Understand the implementation of symbol table using hashing techniques - Apply advanced abstract data type (ADT) and data structures in solving real world problem - Effectively combine the fundamental data structures and algorithmic techniques in building a solution to a given problem - Develop algorithms for text processing applications					
UNIT - I		Lecture Hrs:			
Dictionaries : Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.					
UNIT - II		Lecture Hrs:			
Skip Lists : Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists, Trees: Binary Search Trees (BST), AVL Trees, Red Black Trees: Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top-Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations.					
UNIT - III		Lecture Hrs:			
2-3 Trees , Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, B-Trees: Advantage of B- trees over BSTs, Height of B-Tree, Search and Update Operations on 2-3 Trees, Analysis of Operations, Splay Trees: Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying.					
UNIT - IV		Lecture Hrs:			
Text Processing: Sting Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem					
UNIT - V		Lecture Hrs:			
Computational Geometry: One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadrees, k-D Trees.					
Textbooks:					
1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, second Edition, Pearson, 2004. 2. T.H. Cormen, C.E. Leiserson, R.L.Rivest, Introduction to Algorithms, Third Edition Prentice Hall, 2009					
Reference books:					
1. Michael T. Goodrich, Roberto Tamassia, Algorithm Design, First Edition, Wiley, 2006.					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED COMPUTER NETWORKS	L	T	P	C
21D58102		3	0	0	3
Semester		I			
Course Objectives:					
The objective of this course is to build a solid foundation in computer networks concepts and design - To understand computer network architectures, protocols, and interfaces. - The OSI reference model and the Internet architecture network applications. - The course will expose students to the concepts of traditional as well as modern day computer networks - wireless and mobile, multimedia-based. - Students completing this course will understand the key concepts and practices employed in modern computer networking					
Course Outcomes (CO): Student will be able to					
- Analyse computer network architectures and estimate quality of service - Design application-level protocols for emerging networks - Analyse TCP and UDP traffic in data networks - Design and analyse medium access methods, routing algorithms and IPv6 protocol for data networks - Analyze Data Center Networks and Optical Networks					
UNIT - I		Lecture Hrs:			
Network Architecture, Performance: Bandwidth and Latency, High Speed Networks, Network-Centric View, Error Detection, Reliable Transmission, Ethernet and Multiple Access Networks, Overlay Networks: Routing Overlays, Peer-to-Peer Networks and Content Distribution Networks, Client-Server Networks, Delay-Tolerant Networks,					
UNIT - II		Lecture Hrs:			
Switching: Circuit-Switched Networks, Datagram Networks, Virtual-Circuit Networks, Message-Switched Networks, Asynchronous Transfer Mode: Evolution, Benefits, Concepts, Exploring Broadband Integrated Services Digital Network, Layer and Adaptation Layer, IPv4: Address Space, Notations, Classful, Classless, Network Address Translation, Datagram					
UNIT - III		Lecture Hrs:			
Fragmentation and Checksum IPv6 Addresses: Structure, Address Space, Packet Format and Extension Headers, ICMP, IGMP, ARP, RARP, Congestion Control and Resource Allocation: Problem, Issues, Queuing, TCP Congestion Control, Congestion-Avoidance Mechanisms and Quality of Service,					
UNIT - IV		Lecture Hrs:			
Internetworking: Intra-Domain and Inter-Domain Routings, Unicast Routing Protocols: RIP, OSPF and BGP, Multicast Routing Protocols: DVMRP, PIM-DM, PIM-SM, CBT, MSDP and MOSPF, Spanning Tree Algorithm, Optical Networking: SONET/SDH Standards, Traffic Engineering: Requirement, Traffic Sizing, Characteristics, Protocols, Time and Delay Considerations, Connectivity, Availability, Reliability and Maintainability and Throughput.					
UNIT - V		Lecture Hrs:			
Multimedia Over Internet: Transmission, IP Multicasting and VoIP, Domain Name System: Name Space, Domain Name Space, Distribution, Domains, Resolutions and Dynamic Domain Name System, SNMP, Security: IPSec, SSL/TLS, PGP and Firewalls, Datacenter Design and Interconnection Networks.					
Textbooks:					
- Larry L. Peterson and Bruce S. Davie, Computer Networks: A System Approach, Fifth Edition, Morgan Kaufmann, Elsevier, 2012. - Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, Fifth Edition, 2017.					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

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|---|
| 3. Chwan-Hwa (John) Wu, J. David Irwin, Introduction to Computer Networks and Cyber Security, CRC press, Taylor & Francis Group, 2014 |
| 4. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Pearson, 5th Edition, 2014. |

Reference Books:

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| 1. Satish Jain Advanced Computer Networking: Concepts and Applications |
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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	MACHINE LEARNING (Common to M.Tech CSE, SE, AI & ML)	L	T	P	C
21D58103a		3	0	0	3
Semester		I			
Course Objectives:					
- To understand various key paradigms for machine learning approaches. - To familiarize with the mathematical and statistical techniques used in machine learning. - To understand and differentiate among various machine learning techniques.					
Course Outcomes (CO): Student will be able to					
- To formulate a machine learning problem - Select an appropriate pattern analysis tool for analysing data in a given feature space. - Apply pattern recognition and machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data.					
UNIT - I		Lecture Hrs:			
Introduction: Definitions, Datasets for Machine Learning, Different Paradigms of Machine Learning, Data Normalization, Hypothesis Evaluation, VC-Dimensions and Distribution, Bias-Variance Tradeoff, Regression					
UNIT - II		Lecture Hrs:			
Bayes Decision Theory: Bayes decision rule, Minimum error rate classification, Normal density and discriminant functions. Parameter Estimation: Maximum Likelihood and Bayesian Parameter Estimation					
UNIT - III		Lecture Hrs:			
Discriminative Methods: Distance-based methods, Linear Discriminant Functions, Decision Tree, Random Decision Forest and Boosting Feature Selection and Dimensionality Reduction: PCA, LDA, ICA, SFFS, SBFS					
UNIT - IV		Lecture Hrs:			
Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-means partitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labelled and unlabelled data.					
UNIT - V		Lecture Hrs:			
Kernel Machines: Kernel Tricks, SVMs (primal and dual forms), K-SVR, K-PCA (6 Lectures) Artificial Neural Networks: MLP, Backprop, and RBF-Net					
Textbooks:					
1. Shalev-Shwartz, S., Ben-David, S., (2014), Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press 2. R. O. Duda, P. E. Hart, D. G. Stork (2000), Pattern Classification, Wiley-Blackwell, 2nd Edition.					
Reference Books:					
1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press. 2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001 3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	OBJECT ORIENTED SOFTWARE ENGINEERING	L	T	P	C
21D58103b		3	0	0	3
	Semester	I			
Course Objectives:					
- To learn and understand various O-O concepts along with their applicability contexts. - Given a problem, identify domain objects, their properties, and relationships among them. - How to identify and model/represent domain constraints on the objects and (or) on their relationships - To learn various modelling techniques to model different perspectives of object-oriented software design (UML)					
Course Outcomes (CO): Student will be able to					
- Discuss about software development process models - Identify the contemporary issues and discuss about coding standards - Recognize the knowledge about testing methods and comparison of various testing techniques. - Use the concept and standards of quality and getting knowledge about software quality assurance group.					
UNIT - I		Lecture Hrs:			
Introduction to Software Engineering - Software Development process models – Agile Development - Project & Process - Project management - Process& Project metrics - Object Oriented concepts, Principles & Methodologies.					
UNIT - II		Lecture Hrs:			
Software Requirements Specification, Software prototyping - Software project planning - Scope - Resources - Software Estimation - Empirical Estimation Models – Planning - Risk Management - Software Project Scheduling - Object Oriented Estimation & Scheduling.					
UNIT - III		Lecture Hrs:			
Analysis Modelling - Data Modelling - Functional Modelling& Information Flow - BehaviouralModelling-Structured Analysis - Object Oriented Analysis - Domain Analysis-Object oriented Analysis process - Object Relationship Model - Object Behaviour Model, Design modelling with UML.					
UNIT - IV		Lecture Hrs:			
Design Concepts & Principles - Design Process - Design Concepts - Modular Design - Design Effective Modularity - Introduction to Software Architecture - Data Design - Transform Mapping - Transaction Mapping - Object Oriented Design - System design process- Object design process - Design Patterns.					
UNIT - V		Lecture Hrs:			
Top - Down, Bottom-Up, object oriented product Implementation & Integration. Software Testing methods- White Box, Basis Path-Control Structure - Black Box - Unit Testing - Integration testing - Validation & System testing - Testing Tools – Software Maintenance &Reengineering.					
Textbooks:					
1. Fairley R, “Software Engineering Concepts”, second edition, Tata McGraw Hill,NewDelhi, 2003. 2. Jalote P, “An Integrated Approach to Software Engineering”, third edition, NarosaPublishers, New Delhi, 2013.					
Reference Books:					
1. Grady Booch, James Rumbaugh, Ivar Jacobson - "the Unified Modeling Language User Guide" - Addison Wesley, 1999. 2. Ali Bahrami, “Object Oriented Systems Development” 1st Edition, The McGraw-Hill Company, 1999					


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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	DIGITAL IMAGE AND VIDEO PROCESSING	L	T	P	C
21D58103c		3	0	0	3
	Semester	I			
Course Objectives:					
- To study the image fundamentals and mathematical transforms necessary for image Processing. - To study the image enhancement techniques - To study image restoration procedures. - To study the image compression procedures.					
Course Outcomes (CO): Student will be able to					
- Review the fundamental concepts of a digital image processing system. - Analyse images in the frequency domain using various transforms. - Evaluate the techniques for image enhancement and image restoration. - Categorize various compression techniques					
UNIT - I		Lecture Hrs:			
Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing. Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms					
UNIT - II		Lecture Hrs:			
Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering. Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind de-convolution.					
UNIT - III		Lecture Hrs:			
Image Segmentation: Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour Image Compression: Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.					
UNIT - IV		Lecture Hrs:			
Basic Steps of Video Processing: Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.					
UNIT - V		Lecture Hrs:			
2-D Motion Estimation: Optical flow, General Methodologies, Pixel Based Motion Estimation, Block Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.					
Textbooks:					
1. Digital Image Processing – Gonzaleze and Woods, 3rdEd., Pearson. 2. Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang.1st Ed., PH Int.					



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Reference Books:
1. S.Jayaraman, S.Esakkirajan and T.VeeraKumar, “Digital Image processing, TataMcGraw Hill publishers, 2009



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	DATA SCIENCE	L	T	P	C
21D58104a		3	0	0	3
	Semester	I			
Course Objectives:					
• Provide you with the knowledge and expertise to become a proficient data scientist. • Demonstrate an understanding of statistics and machine learning concepts that are vital for data science; • Produce Python code to statistically analyse a dataset; • Critically evaluate data visualizations based on their design and use for communicating stories from data;					
Course Outcomes (CO): Student will be able to					
• Explain how data is collected, managed and stored for data science; • Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists; • Implement data collection and management scripts using MongoDB					
UNIT - I		Lecture Hrs:			
Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.					
UNIT - II		Lecture Hrs:			
Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources					
UNIT - III		Lecture Hrs:			
Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance ,Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes					
UNIT - IV		Lecture Hrs:			
Data visualization: Introduction, Types of data visualisation, Data for visualisation: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings					
UNIT - V		Lecture Hrs:			
Applications of Data Science, Technologies for visualisation, Bokeh (Python) Recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science					
Textbooks:					
1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly. 2. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press					
Reference Books:					
1. Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013. 2. Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O’Reilly, 2013. 3. Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. Springer, 2009. 4. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.2018. 5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press, 2014. 6. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011.					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	DESIGN PATTERNS (Common to M.Tech CSE, CN, SE)	L	T	P	C
21D58104b		3	0	0	3
	Semester	I			
Course Objectives:					
- Understand the concept of Design patterns and its importance. - Understand the behavioural knowledge of the problem and solutions. - Relate the Creational, Structural ,behavioural Design patterns. - Apply the suitable design patterns to refine the basic design for given context					
Course Outcomes (CO): Student will be able to					
- Identify the appropriate design patterns to solve objectoriented design problems. - Develop design solutions using creational patterns. - Apply structural patterns to solve design problems. - Construct design solutions by using behavioral patterns.					
UNIT - I		Lecture Hrs:			
Introduction : What Is a Design Pattern?, Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.					
UNIT - II		Lecture Hrs:			
A Case Study : Designing a Document Editor : Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary .					
UNIT - III		Lecture Hrs:			
Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.Structural Pattern Part-I : Adapter, Bridge, Composite.					
UNIT - IV		Lecture Hrs:			
Structural Pattern Part-II : Decorator, Façade, Flyweight, Proxy.Behavioural Patterns Part-I : Chain of Responsibility, Command, Interpreter, Iterator.					
UNIT - V		Lecture Hrs:			
Behavioral Patterns Part-II : Mediator, Memento, Observer, State, Strategy, Template Method ,Visitor, Discussion of Behavioral Patterns.					
Textbooks:					
1. Design Patterns By Erich Gamma, Pearson Education					
Reference Books:					
1. Erich Gamma , Richard Helm, Ralph Johnson, John Vlissides , Grady Booch Design Patterns: Elements of Reusable Object-Oriented Software					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	INFORMATION SECURITY	L	T	P	C
21D58104c		3	0	0	3
Semester		I			
Course Objectives:					
- To understand basics of Cryptography and Network Security. - To be able to secure a message over insecure channel by various means. - To learn about how to maintain the Confidentiality, Integrity and Availability of a Data - To understand various protocols for network security to protect against the threats in the networks.					
Course Outcomes (CO): Student will be able to					
- Provide security of the data over the network. - Do research in the emerging areas of cryptography and network security. - Implement various networking protocols. - Protect any network from the threats in the world					
UNIT - I	Lecture Hrs:				
Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.					
UNIT - II	Lecture Hrs:				
Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC.					
UNIT - III	Lecture Hrs:				
Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.					
UNIT - IV	Lecture Hrs:				
Email privacy: Pretty Good Privacy (PGP) and S/MIME. IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.					
UNIT - V	Lecture Hrs:				
Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). Basic concepts of SNMP, SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats.					
Textbooks:					
1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education. 2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn IdoDubrawsky, Steve W. Manzuik and Ryan Permeah, wileyDreamtech, 3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson					
Reference Books:					
1. Network Security and Cryptographyl, Bernard Menezes ,Cengage Learning. 2. Cryptography and Securityl, C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India. 3. Applied Cryptography, Bruce Schiener, 2nd edition, John Wiley & Sons. 4. Cryptography and Network Securityl, AtulKahate, TMH. 5. Introduction to Cryptographyl, Buchmann, Springer. 6. Number Theory in the Spirit of Ramanujanl, Bruce C.Berndt, University Press 7. Introduction to Analytic Number Theoryl, Tom M.Apostol. University Press					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED DATA STRUCTURES AND ALGORITHMS LAB (Common to M.Tech CSE, CN, SE, AI & ML)	L	T	P	C
21D58105		0	0	4	2
Semester		I			
Course Objectives:					
• Implement linear and non linear data structures. • Analyze various algorithms based on their time complexity. • Choose appropriate data structure and algorithm design method for a specific application. • Identify suitable data structure to solve various computing problems.					
Course Outcomes (CO):					
• Implement divide and conquer techniques to solve a given problem. • Implement hashing techniques like linear probing, quadratic probing, random probing and double hashing/rehashing. • Perform Stack operations to convert infix expression into post fix expression and evaluate the post fix expression. • Differentiate graph traversal techniques Like Depth First Search, Breadth First Search. Identify shortest path to other vertices using various algorithms.					
List of Experiments:					
• To implement functions of Dictionary using Hashing (division method, Multiplication method, Universal hashing). • To perform various operations i.e., insertions and deletions on AVL trees. • To perform various operations i.e., insertions and deletions on 2-3 trees. • To implement operations on binary heap. • To implement operations on graphs • To implement Depth First Search for a graph non-recursively. • To implement Breadth First Search for a graph non-recursively. • To implement Prim's algorithm to generate a min-cost spanning tree. • To implement Krushkal's algorithm to generate a min-cost spanning tree. • To implement Dijkstra's algorithm to find shortest path in the graph.					



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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED COMPUTER NETWORKS LAB	L	T	P	C
21D58106		0	0	4	2
	Semester	I			
Course Objectives:					
Aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks					
Course Outcomes (CO):					
Develop programs for client-server applications Perform packet sniffing and analyze packets in network traffic. Implement error detecting and correcting codes Implement network security algorithms					
List of Experiments:					
- Implementation of client server programs for different network applications - Study and analysis of the network using Wireshark network protocol analyser - Implementation of topology generation for network simulation - Implementation of queuing management - Implementation of MAC-layer protocols - Implementation of routing protocols - Implementation of transport-layer protocols - Implementation of network security mechanisms					


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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	RESEARCH METHODOLOGY AND IPR (Common to M.Tech CSE, CN, SE, AI & ML)	L	T	P	C
21DRM101		2	0	0	2
Semester		I			
Course Objectives:					
- Identify an appropriate research problem in their interesting domain. - Understand ethical issues understand the Preparation of a research project thesis report. - Understand the Preparation of a research project thesis report - Understand the law of patent and copyrights. - Understand the Adequate knowledge on IPR					
Course Outcomes (CO): Student will be able to					
- Analyze research related information - Follow research ethics - Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. - Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. - Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.					
UNIT - I		Lecture Hrs:			
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, scope, and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations					
UNIT - II		Lecture Hrs:			
Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.					
UNIT - III		Lecture Hrs:			
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.					
UNIT - IV		Lecture Hrs:			
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.					
UNIT - V					
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.					
Textbooks:					
1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students” 2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”					
Reference Books:					
1. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners” 2. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007. 3. Mayall, “Industrial Design”, McGraw Hill, 1992. 4. Niebel, “Product Design”. McGraw Hill. 1974.					



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ANANTHAPURAMU – 515 002 (A.P) INDIA

M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

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| <ol style="list-style-type: none">5. Asimov, “Introduction to Design”, Prentice Hall, 1962.6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in New Technological Age”, 2016. |
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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED OPERATING SYSTEMS		L	T	P	C
21D58201			3	0	0	3
Semester			II			
Course Objectives:						
- To be able to read and understand sample open source programs and header files. - System calls which explore networking and security Applications.. - To acquire the knowledge in the implementation of interprocess communication.						
Course Outcomes (CO): Student will be able to						
- To explain the functionality of a large software system by reading its source. - To revise any algorithm present in a system. - Inter process communication mechanism - Android mobiles inner process system						
UNIT - I				Lecture Hrs:		
Basic Operating System Concepts - Overview of Unix File System - Files - Links - Types - Inodes -Access Rights - System Calls - Overview of Unix Kernels -Model - Implementation - Reentrant Kernels - Address Space - Synchronization - Interprocess Communication - Process Management - Memory Management - Device Drivers.						
UNIT - II				Lecture Hrs:		
Processes, Lightweight Processes, and Threads - Process Descriptor - State - Identifying a Process - Relationships among processes - Organization - Resource Limits - Creating Processes - System Calls - Kernel Threads - Destroying Processes -Termination - Removal.						
UNIT - III				Lecture Hrs:		
The Virtual File System (VFS) - Role - File Model -System Calls - Data Structures - Super Block, Inode, File, dentry Objects - dentry Cache - Files Associated with a Process - Filesystem Types - Special Files systems – Filesystem Type Registration – Filesystem Handling - Namespaces - Mounting – Unmounting - Implementation of VFS System Calls.						
UNIT - IV				Lecture Hrs:		
Windows Operating system - versions, Concepts and tools, Windows internals, System Architecture, Requirements and design goals, Operating system model, Architecture overview. Key system components. System mechanisms - Trap dispatching, object manager, Synchronization, System worker threads, Windows global flags, Local procedural calls, Kernelevent tracing.						
UNIT - V				Lecture Hrs:		
what is android, basic building blocks – activities, services, broadcast receivers & content, ui components- views & notifications, components for communication -intents & intent filters, android api levels launching emulator editing emulator settings emulator shortcuts log cat usage, Applications of Android.						
Textbooks:						
- Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", 3rd Edition, O'Reilly Publications, 2005. - Harold Abelson, Gerald Jay Sussman and Julie Sussman, —Structure and Interpretation of Computer Programs, Second Edition, Universities Press, 2013.						
Reference Books:						
Mark E. Russinovich and David A. Solomon, Microsoft Windows Internals, 4th Edition, Microsoft Press, 2004.						



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COURSE STRUCTURE & SYLLABI

Course Code	INTERNET OF THINGS	L	T	P	C
21D58202		3	0	0	3
Semester		II			
Course Objectives:					
Introduce the fundamental concepts of IoT and physical computing - Expose the student to a variety of embedded boards and IoT Platforms - Create a basic understanding of the communication protocols in IoT communications. - Familiarize the student with application program interfaces for IoT. - Enable students to create simple IoT applications.					
Course Outcomes (CO): Student will be able to - Choose the sensors and actuators for an IoT application - Select protocols for a specific IoT application - Utilize the cloud platform and APIs for IoT applications - Experiment with embedded boards for creating IoT prototypes - Design a solution for a given IoT application - Establish a startup					
UNIT - I		Lecture Hrs:			
Overview of IoT: The Internet of Things: An Overview, The Flavor of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things? Design Principles for Connected Devices: Calm and Ambient Technology, Privacy, Web Thinking for Connected Devices, Affordances. Prototyping: Sketching, Familiarity, Costs Vs Ease of Prototyping, Prototypes and Production, Open source Vs Close source, Tapping into the community.					
UNIT - II		Lecture Hrs:			
Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things					
UNIT - III		Lecture Hrs:			
Communication in the IoT: Internet Communications: An Overview, IP Addresses, MAC Addresses, TCP and UDP Ports, Application Layer Protocols Prototyping Online Components: Getting Started with an API, Writing a New API, Real-Time Reactions, Other Protocols Protocol					
UNIT - IV		Lecture Hrs:			
Business Models: A short history of business models, The business model canvas, Who is the business model for, Models, Funding an Internet of Things startup, Lean Startups. Manufacturing: What are you producing, Designing kits, Designing printed circuit boards.					
UNIT - V		Lecture Hrs:			
Manufacturing continued: Manufacturing printed circuit boards, Mass-producing the case and other fixtures, Certification, Costs, Scaling up software. Ethics: Characterizing the Internet of Things, Privacy, Control, Environment, Solutions					
Textbooks:					
1.Adrian McEwen, Hakim Cassimally - Designing the Internet of Things, Wiley Publications, 2012					
Reference Books:					
1. HaiderRaad Fundamentals of IoT and Wearable Technology Design, Wiley Publications2020. 2. KashishAraShakil,Samiya Khan, Internet of Things (IoT) Concepts and Applications,Springer Publications 2020.					



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COURSE STRUCTURE & SYLLABI

Course Code	DEEP LEARNING	L	T	P	C
21D58203a		3	0	0	3
	Semester	II			
Course Objectives:					
- To present the mathematical, statistical and computational challenges of building neural networks. - To teach the concepts of deep learning. - To introduce dimensionality reduction techniques. - To enable the students to know deep learning techniques to support real-time applications. - To explain the case studies of deep learning techniques.					
Course Outcomes (CO): Student will be able to					
- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains. - Implement deep learning algorithms and solve real-world problems.					
UNIT - I		Lecture Hrs:			
Introduction: Introduction to machine learning- Linear models (SVMs and Perceptron's, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.					
UNIT - II		Lecture Hrs:			
Deep Networks: History of Deep Learning- A Probabilistic Theory of Deep Learning- Back propagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow Networks Convolutional Networks - Generative Adversarial Networks (GAN), Semi-supervised Learning .					
UNIT - III		Lecture Hrs:			
Dimensionality Reduction: Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyper parameter optimization.					
UNIT - IV		Lecture Hrs:			
Optimization and Generalization: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.					
UNIT - V		Lecture Hrs:			
Case Study and Applications: Image net- Detection-Audio Wave Net-Natural Language Processing Word2Vec - Joint Detection Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions.					
Textbooks:					
1. Deep Learning”, Ian Goodfellow, YoshuaBengio , Aaron Courville, MIT Press 2016.					
Reference Books:					
1. “Neural Networks and Deep Learning A Text Book”, Charu C Aggarwal, Springer International Publishing AG, Part of Springer Nature 2018.					



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COURSE STRUCTURE & SYLLABI

Course Code	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
21D58203b		3	0	0	3
	Semester	II			
Course Objectives:					
- Understand SOA and evolution of SOA. - Understand web services and primitive, contemporary SOA. - Understand various service layers. - Understand service-oriented analysis and design based on guidelines.					
Course Outcomes (CO): Student will be able to					
- Comprehend the need for SOA and its systematic evolution - Apply SOA technologies to enterprise domain - Design and analyse various SOA patterns and techniques - Compare and evaluate best strategies and practices of SOA					
UNIT - I		Lecture Hrs:			
Introducing SOA: Fundamental SOA, Common Characteristics of Contemporary SOA, Common Tangible Benefits of SOA, Common Pitfalls of Adopting SOA. The Evolution of SOA: An SOA Timeline, The Continuing Evolution of SOA, The Roots of SOA.					
UNIT - II		Lecture Hrs:			
Web Services and Primitive SOA: The Web Services Frame Work, Services, Service Descriptions, Messaging. Web Services and Contemporary SOA (Part I-Activity management and Composition): Message Exchange Patterns, Service Activity, Coordination, Atomic Transactions, Orchestration, and Choreography. Web Services and Contemporary SOA (Part-II-Advanced Messaging, Metadata and Security): Addressing, Reliable Messaging, Correlation, Policies, Metadata exchange, Security.					
UNIT - III		Lecture Hrs:			
Principles of Service-Orientation: Service–Orientation and the Enterprise, Anatomy of SOA, Common Principles of Service–Orientation, Interrelation between Principles of Service- Orientation, Service Orientation and Object Orientation, Native Web Services Support for Principles of Service-Orientation. Service Layers: Service-Orientation and Contemporary SOA, Service Layer abstraction, Application Service Layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration Scenarios.					
UNIT - IV		Lecture Hrs:			
SOA Delivery Strategies: SOA Delivery Lifecycle Phases, The Top-Down Strategy, The Bottom-up Strategy, The Agile Strategy. Service Oriented Analysis (Part I-Introduction): Introduction to Service Oriented Analysis, Benefits of a Business Centric SOA, Deriving Business Services. Service Oriented Analysis (Part-II-Service Modelling): Service Modelling, Service Modelling Guidelines, Classifying Service Model Logic, Contrasting Service Modelling Approaches. Service Oriented Design (Part I-Introduction): Introduction to Service-Oriented Design, WSDL Related XML Schema Language Basics, WSDL Language Basics, Service Interface Design Tools. Service Oriented Design (Part II-SOA Composition Guidelines): SOA Composing Steps, Considerations for Choosing Service Layers, Considerations for Positioning Core SOA Standards, Considerations for Choosing SOA Extensions.					
UNIT - V		Lecture Hrs:			
Service Oriented Design (Part III- Service Design): Service Design Overview, Entity- Centric Business Service Design, Application Service Design, Task-Centric Business Service Design, Service Design Guidelines. Service Oriented Design (Part IV-Business Process Design): WS-BPEL Language Basics, WS- Coordination Overview, Service Oriented Business Process Design.					
Textbooks:					
1.Service-Oriented Architecture-Concepts, Technology, and Design, Thomas Erl, Pearson Education, 2006.					



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COURSE STRUCTURE & SYLLABI

2.Understanding SOA with Web Services, Eric Newcomer, Greg Lomow, Pearson Education, 2005.

Reference Books:

1. Thomas Erl; Service Oriented Architecture Concepts Technology & Design, Pearson Education Limited; 2015, ISBN-13: 9788131714904.
- 2 Guido Schmutz, Peter Welkenbach, Daniel Liebhart; Service Oriented Architecture An Integration Blueprint; Shroff Publishers & Distributors; 2010, ISBN-13: 9789350231081



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COURSE STRUCTURE & SYLLABI

Course Code	COMPUTER VISION (Common to M.Tech CSE, AI & ML)	L	T	P	C
21D58203c		3	0	0	3
	Semester	II			
Course Objectives:					
• Be familiar with both the theoretical and practical aspects of computing with images. • Have described the foundation of image formation, measurement, and analysis. • Understand the geometric relationships between 2D images and the 3D world. • Grasp the principles of state-of-the-art deep neural networks					
Course Outcomes (CO): Student will be able to					
• Develop the practical skills necessary to build computer vision applications. • To have gained exposure to object and scene recognition and categorization from images					
UNIT - I		Lecture Hrs:			
Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis					
UNIT - II		Lecture Hrs:			
Edge detection, Edge detection performance, Hough transform, corner detection					
UNIT - III		Lecture Hrs:			
Segmentation, Morphological filtering, Fourier transform					
UNIT - IV		Lecture Hrs:			
Feature extraction, shape, histogram, colour, spectral, texture, using CVIPtools, Feature analysis, feature vectors, distance /similarity measures, data pre-processing					
UNIT - V		Lecture Hrs:			
Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians, Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods					
Textbooks:					
1. Computer Vision: Algorithms and Applications by Richard Szeliski.					
Reference Books:					
1. Deep Learning, by Goodfellow, Bengio, and Courville. 2. Dictionary of Computer Vision and Image Processing, by Fisher et al.					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	DATA VISUALIZATION TECHNIQUES	L	T	P	C
21D58204a		3	0	0	3
Semester		II			
Course Objectives:					
- To develop skills to both design and critique visualizations. - To introduce visual perception and core skills for visual analysis. - To understand visualization for time-series analysis. - To understand visualization for ranking analysis. - To understand visualization for deviation analysis..					
Course Outcomes (CO): Student will be able to					
- Explain principles of visual perception - Apply core skills for visual analysis - Apply visualization techniques for various data analysis tasks - Design information dashboard					
UNIT - I		Lecture Hrs:			
Information visualization – effective data analysis – traits of meaningful data – visual perception – making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples.					
UNIT - II		Lecture Hrs:			
Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices.					
UNIT - III		Lecture Hrs:			
Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence.					
UNIT - IV		Lecture Hrs:			
Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.					
UNIT - V		Lecture Hrs:			
Plotting Geospatial Data: Introduction to Geoplotlib, Design Principles of Geoplotlib, Geospatial Visualizations, Plotting Geospatial Data on a Map Web-Based Visualizations: Concepts of Bokeh, Interfaces-Plotting and Model Interfaces, Output, Bokeh Server, Presentation, Integrating – HTML Document and Bokeh Applications					
Textbooks:					
- Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008. - Mario Dobler, Tim Grobmann, “Data Visualization with Python”, O’Reilly, First Edition, 2019					
Reference Books:					
Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013.					



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COURSE STRUCTURE & SYLLABI

Course Code	DISTRIBUTED SYSTEMS	L	T	P	C
21D58204b		3	0	0	3
Semester		II			
Course Objectives:					
To introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment, and to provide insight into related research problems					
Course Outcomes (CO): Student will be able to					
- Design trends in distributed systems. - Apply network virtualization. - Apply remote method invocation and objects					
UNIT - I		Lecture Hrs:			
Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues					
UNIT - II		Lecture Hrs:			
DISTRIBUTED DATABASE DESIGN Alternative design strategies; Distributed design issues; Fragmentation; Data Allocation SEMANTICS DATA CONTROL View management; Data security; Semantic Integrity Control QUERY PROCESSING ISSUES Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data					
UNIT - III		Lecture Hrs:			
Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms TRANSACTION MANAGEMENT The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models CONCURRENCY CONTROL Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management					
UNIT - IV		Lecture Hrs:			
Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols					
UNIT - V		Lecture Hrs:			
PARALLEL DATABASE SYSTEMS Parallel architectures; parallel query processing and optimization; load balancing ADVANCED TOPICS Mobile Databases, Distributed Object Management, Multi-databases					
Textbooks:					
1. Principles of Distributed Database Systems, M.T. Ozsu and P. Valduriez, Prentice-Hall, 1991.					
Reference Books:					
1. Distributed Database Systems, D. Bell and J. Grimson, Addison-Wesley, 1992.					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	PRIVACY PRESERVING DATA PUBLISHING	L	T	P	C
21D58204c		3	0	0	3
	Semester	II			
Course Objectives:					
- Will be able to decide, given an application, if it should be formulated as a data privacy problem. If yes, the students will be able to formally define the problem and state what properties can be guaranteed by applying differential privacy. - Will have understanding of how (and why) randomness (or uncertainty) provides privacy protection. - Will be able to analyse real-world privacy problems, identify which privacy-preserving methods are appropriate, and implement the private algorithms in code. - Will be able to evaluate and compare privacy-preserving algorithms.					
Course Outcomes (CO): Student will be able to					
- Apply anonymization methods for sensitive data protection - Apply state-of-art techniques for data privacy protection - Design privacy preserving algorithms for real-world applications - Identify security and privacy issues in OLAP systems - Apply information metrics for Maximizing the preservation of information in the anonymization process					
UNIT - I		Lecture Hrs:			
Fundamentals of defining privacy and developing efficient algorithms for enforcing privacy, challenges in developing privacy preserving algorithms in real-world applications, privacy issues, privacy models,					
UNIT - II		Lecture Hrs:			
Anonymization operations, information metrics, Anonymization methods for the transaction data, trajectory data, social networks data, and textual data, Collaborative Anonymization,					
UNIT - III		Lecture Hrs:			
Access control of outsourced data, Use of Fragmentation and Encryption to Protect Data Privacy, Security and Privacy in OLAP systems.					
UNIT - IV		Lecture Hrs:			
Extended Data publishing Scenarios, Anonymization for Data Mining, publishing social science data,					
UNIT - V		Lecture Hrs:			
Continuous user activity monitoring (like in search logs, location traces, energy monitoring), social networks, recommendation engines and targeted advertising.					
Textbooks:					
1. Benjamin C.M. Fung, Ke Wang, Ada Wai-Chee Fu and Philip S. Yu, Introduction to PrivacyPreserving Data Publishing: Concepts and Techniques, 1st Edition, Chapman & Hall/CRC, 2010.					
Reference Books:					
1. Bee-Chung Chen, Daniel Kifer, AshwinMachanavajjhala, Kristen LeFevre Privacy-Preserving Data Publishing ,Now Publishers Inc, 2009.					



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COURSE STRUCTURE & SYLLABI

Course Code	ADVANCED OPERATING SYSTEMS LAB	L	T	P	C
21D58205		0	0	4	2
	Semester	II			
Course Objectives:					
- To study Linux memory management data structures and algorithms. - To acquire the knowledge in the implementation of interprocess communication. - To understand how program execution happens in Linux.					
Course Outcomes (CO):					
- To revise any algorithm present in a system. - To design a new algorithm to replace an existing one. - To appropriately modify and use the data structures of the linux kernel for a different software system					
List of Experiments:					
- Write programs using the following system calls of UNIX operating system: 40 fork, exec, getpid, exit, wait, close, stat, opendir, readdir - Write programs using the I/O system calls of UNIX operating system (open, read, write, etc) - Write C programs to simulate UNIX commands like ls, grep, etc. - Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions) - Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions) - Developing Application using Inter Process communication (using shared memory, pipes or message queues) - Implement the Producer – Consumer problem using semaphores (using UNIX system calls).					



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COURSE STRUCTURE & SYLLABI

Course Code	INTERNET OF THINGS LAB	L	T	P	C
21D58206		0	0	4	2
Semester		II			
Course Objectives:					
The main objective IOT applications is to know the different real time sensors used to measure the different electrical parameters and to control the different devices from anywhere through IOT.					
Course Outcomes (CO):					
- The students will be thorough about the technology behind the IoT and associated technologies - The students will be able to use the IoT technologies in practical domains of society - The students will be able to gain knowledge about the state of the art methodologies in IoT application domains.					
List of Experiments:					
- Exercise on Eclipse IoT Project. - Experiments on few Eclipse IoT Projects. - Any Experiment on architecture of Iot Toolkit. - Exercise on smart object API Gateway service reference implementation in IoTToolkit. - Experiment on HTTP-to-CoAP semantic mapping Proxy in IoT Toolkit. - Experiment on Gate way as a service deployment in IoT Toolkit. - Experiment on application framework and embedded software agents for IoT Toolkit					



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COURSE STRUCTURE & SYLLABI

Course Code	SOFTWARE DEFINED NETWORKS	L	T	P	C
21D58301a		3	0	0	3
Semester		III			
Course Objectives:					
This course introduces about software defined networking, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network.					
Course Outcomes (CO): Student will be able to					
- Differentiate between traditional networks and software defined networks and understand the key benefits and use cases of SDN. - Interpret the SDN data plane devices and OpenFlow Protocols - Implement the operation of SDN control plane with different controllers - Apply techniques that enable applications to control the underlying network using SDN - Evaluate Network Functions Virtualization components and their roles in SDN					
UNIT - I		Lecture Hrs:			
Evolving network requirements-The SDN Approach: Requirements, SDN Architecture, Characteristics of Software-Defined Networking, SDN and NFV-Related Standards: Standards-Developing Organizations, Industry Consortia, Open Development Initiatives.					
UNIT - II		Lecture Hrs:			
SDN data plane: Data plane Functions, Data plane protocols, Open flow logical network Device: Flow table Structure, Flow Table Pipeline, The Use of Multiple Tables, Group Table- Open Flow Protocol.					
UNIT - III		Lecture Hrs:			
SDN Control Plane Architecture: Control Plane Functions, Southbound Interface, Northbound Interface, Routing, ITU-T Model- OpenDaylight-REST- Cooperation and Coordination Among Controllers					
UNIT - IV		Lecture Hrs:			
SDN Application Plane Architecture: Northbound Interface, Network Applications, User Interface- Network Services Abstraction Layer: Abstractions in SDN, Frenetic- Traffic Engineering Measurement and Monitoring Security- Data CentreNetworking- Mobility and Wireless.					
UNIT - V		Lecture Hrs:			
Background and Motivation for NFV- Virtual Machines- NFV Concepts: Simple Example of the Use of NFV, NFV Principles, High-Level NFV Framework, NFV Benefits and Requirements- NFV Reference Architecture: NFV Management and Orchestration					
Textbooks:					
- Paul Goransson Chuck Black Timothy Culver: Software Defined Networks: A Comprehensive Approach, Morgan Kaufmann, 2016. - Ken Gray Thomas Nadeau: Network Function Virtualization, Morgan Kaufmann, 2016.					
Reference Books:					
Larry Peterson , Carmelo Cascone , Bruce Davie: Software-Defined Networks: A Systems Approach, Systems Approach, 2021					



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COURSE STRUCTURE & SYLLABI

Course Code	REINFORCEMENT LEARNING (Common for MTech CSE, AI & ML)	L	T	P	C
21D58301b		3	0	0	3
	Semester	III			
Course Objectives:					
Reinforcement Learning is a subfield of Machine Learning, but is also a general-purpose formalism for automated decision-making and AI. This course introduces you to statistical learning techniques where an agent explicitly takes actions and interacts with the world.					
Course Outcomes (CO): Student will be able to					
- Formulate Reinforcement Learning problems - Apply various Tabular Solution Methods to Markov Reward Process Problems - Apply various Iterative Solution methods to Markov Decision Process Problems - Comprehend Function approximation methods					
UNIT - I		Lecture Hrs:			
Introduction: Introduction to Reinforcement Learning (RL) – Difference between RL and Supervised Learning, RL and Unsupervised Learning. Elements of RL, Markov property, Markov chains, Markov reward process (MRP).					
UNIT - II		Lecture Hrs:			
Evaluative Feedback - Multi-Arm Bandit Problem: An n-Armed Bandit Problem, Exploration vs Exploitation principles, Action value methods, Incremental Implementation, tracking a non-stationary problem, optimistic initial values, upper-confidence-bound action selection, Gradient Bandits. Introduction to and proof of Bellman equations for MRPs					
UNIT - III		Lecture Hrs:			
Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations. Dynamic Programming (DP): Overview of dynamic programming for MDP, principle of optimality, Policy Evaluation, Policy Improvement, policy iteration, value iteration, asynchronous DP , Generalized Policy Iteration.					
UNIT - IV		Lecture Hrs:			
Monte Carlo Methods for Prediction and Control: Overview of Monte Carlo methods for model free RL, Monte Carlo Prediction, Monte Carlo estimation of action values, Monto Carlo Control, On policy and off policy learning, Importance sampling. Temporal Difference Methods: TD Prediction, Optimality of TD(0), TD Control methods - SARSA, Q-Learning and their variants.					
UNIT - V		Lecture Hrs:			
Eligibility traces: n-Step TD Prediction, Forward and Backward view of TD(λ), Equivalence of forward and backward view, Sarsa(λ),, Watkins’s Q(λ), Off policy eligibility traces using importance of sampling. Function Approximation Methods: Value prediction with function approximation, gradient descent methods, Linear methods, control with function approximation.					
Textbooks:					
- Richard S. Sutton and Andrew G. Barto, Reinforcement Learning: An Introduction", 2nd Edition, The MIT Press. - CsabaSzepesvari – Algorithms for Reinforcement Learning – Morgan & Claypool, 2010.					
Reference Books:					
Reinforcement Learning By Richard S. (University Of Alberta) Sutton,Andrew G. (Co-Director Autonomous Learning Laboratory) Barto					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	DATA ANALYTICS (Common to M.Tech CSE, SE)	L	T	P	C
21D58301c		3	0	0	3
Semester		III			
Course Objectives:					
- To explore the fundamental concepts of data analytics. - To learn the principles and methods of statistical analysis - Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms. - To understand the various search methods and visualization techniques.					
Course Outcomes (CO): Student will be able to					
- Understand the ideas of statistical approaches to learning - Understand the significance of exploratory data analysis (EDA) in data science and apply basic tools (plots, graphs, summary statistics) to perform EDA - Apply basic machine learning algorithms (Linear Regression, k-Nearest Neighbors (k-NN), k-means, Naive Bayes) for predictive modeling. Explore the merits of Naive Bayes technique - Recognize the characteristics of machine learning techniques that are useful to solve real-world problems					
UNIT - I		Lecture Hrs:			
Introduction: What is Data Science? Big Data and Data Science hype and getting past the hype, Why now?, Datafication, Current landscape of perspectives, Skill sets, Life cycle of Data Science, Different phases.					
UNIT - II		Lecture Hrs:			
Exploratory Data Analysis and the Data Science Process: Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA, The Data Science Process, Case Study: RealDirect (online real estate firm), Three Basic Machine Learning Algorithms: Linear Regression, k-Nearest Neighbours (k-NN), k-means.					
UNIT - III		Lecture Hrs:			
One More Machine Learning Algorithm and Usage in Applications: Motivating application: Filtering Spam, Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web, Feature Generation and Feature Selection (Extracting Meaning From Data), Motivating application: user (customer) retention,					
UNIT - IV		Lecture Hrs:			
Feature Generation (brainstorming, role of domain expertise, and place for imagination), Feature Selection algorithms: Filters; Wrappers; Decision Trees; Random Forests, Recommendation Systems: Building a User-Facing Data Product: Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system.					
UNIT - V		Lecture Hrs:			
Data Visualization: Basic principles, ideas and tools for data visualization, Case study on industry projects, Exercise: create your own visualization of a complex dataset, Data Science and Ethical Issues: Discussions on privacy, security, ethics, A look back at Data Science, Next-generation data scientists.					
Textbooks:					
- Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly, 2014. - Jure Leskovek, AnandRajaraman and Jerey Ullman. Mining of Massive Datasets, Cambridge University Press, 2014.					
Reference Books:					
- Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press, 2013. - Foster Provost and Tom Fawcett. Data Science for Business: What You Need to Know about Data Mining and Data-analytic Thinking. O'Reilly, 2013. - Trevor Hastie, Robert Tibshirani and Jerome Friedman. Elements of Statistical Learning, Second Edition. Springer, 2009.					



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COURSE STRUCTURE & SYLLABI

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| <ol style="list-style-type: none">4. Avrim Blum, John Hopcroft and RavindranKannan. Foundations of Data Science.2018.5. Mohammed J. Zaki and Wagner Miera Jr. Data Mining and Analysis: Fundamental Concepts and Algorithms. Cambridge University Press, 2014.6. Jiawei Han, MichelineKamber and Jian Pei. Data Mining: Concepts and Techniques, Third Edition. Morgan Kaufmann, 2011. |
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COURSE STRUCTURE & SYLLABI

AUDIT COURSE-I



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
21DAC101a		2	0	0	0
Semester		I			
Course Objectives: This course will enable students:					
- Understand the essentials of writing skills and their level of readability - Learn about what to write in each section - Ensure qualitative presentation with linguistic accuracy					
Course Outcomes (CO): Student will be able to					
- Understand the significance of writing skills and the level of readability - Analyze and write title, abstract, different sections in research paper - Develop the skills needed while writing a research paper					
UNIT - I	Lecture Hrs:10				
1Overview of a Research Paper- Planning and Preparation- Word Order- Useful Phrases - Breaking up Long Sentences-Structuring Paragraphs and Sentences-Being Concise and Removing Redundancy -Avoiding Ambiguity					
UNIT - II	Lecture Hrs:10				
Essential Components of a Research Paper- Abstracts- Building Hypothesis-Research Problem - Highlight Findings- Hedging and Criticizing, Paraphrasing and Plagiarism, Cauterization					
UNIT - III	Lecture Hrs:10				
Introducing Review of the Literature – Methodology - Analysis of the Data-Findings - Discussion-Conclusions-Recommendations.					
UNIT - IV	Lecture Hrs:9				
Key skills needed for writing a Title, Abstract, and Introduction					
UNIT - V	Lecture Hrs:9				
Appropriate language to formulate Methodology, incorporate Results, put forth Arguments and draw Conclusions					
Suggested Reading					
- Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books) Model Curriculum of Engineering & Technology PG Courses [Volume-I] - Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press - Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman’sbook - Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011					



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COURSE STRUCTURE & SYLLABI

Course Code	DISASTER MANAGEMENT	L	T	P	C
21DAC101b		2	0	0	0
Semester		I			
Course Objectives: This course will enable students:					
- Learn to demonstrate critical understanding of key concepts in disaster risk reduction and humanitarian response. - Critically evaluate disaster risk reduction and humanitarian response policy and practice from Multiple perspectives. - Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations - Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in					
UNIT - I					
Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post- Disaster Diseases and Epidemics					
UNIT - II					
Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.					
UNIT - III					
Disaster Preparedness and Management: Preparedness: Monitoring of Phenomena Triggering A Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.					
UNIT - IV					
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.					
UNIT - V					
Disaster Mitigation: Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India.					
Suggested Reading					



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COURSE STRUCTURE & SYLLABI

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| <ol style="list-style-type: none">1. R.Nishith, Singh AK, “Disaster Management in India: Perspectives, issues and strategies2. “New Royal book
Company.. Sahni, Pardeep Et. Al. (Eds.), ”Disaster Mitigation Experiences And Reflections”, Prentice Hall Of India, New Delhi.3. Goel S.L., Disaster Administration And Management Text And Case Studies”, Deep & Deep Publication Pvt. Ltd., New Delhi |
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COURSE STRUCTURE & SYLLABI

Course Code	SANSKRITFOR TECHNICAL KNOWLEDGE	L	T	P	C
21DAC101c		2	0	0	0
Semester		I			
Course Objectives: This course will enable students:					
- To get a working knowledge in illustrious Sanskrit, the scientific language in the world - Learning of Sanskrit to improve brain functioning - LearningofSanskrittodevelopthelogicinmathematics,science&othersubjects enhancing the memory power - The engineering scholars equipped with Sanskrit will be able to explore the huge - Knowledge from ancientliterature					
Course Outcomes (CO): Student will be able to					
- Understanding basic Sanskrit language - Ancient Sanskrit literature about science &technology can be understood - Being a logical language will help to develop logic in students					
UNIT - I					
Alphabets in Sanskrit,					
UNIT - II					
Past/Present/Future Tense, Simple Sentences					
UNIT - III					
Order, Introduction of roots					
UNIT - IV					
Technical information about Sanskrit Literature					
UNIT - V					
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics					
Suggested Reading					
1.“Abhyaspustakam” –Dr.Vishwas, Sanskrit-Bharti Publication, New Delhi					
2.“Teach Yourself Sanskrit” Prathama Deeksha- VempatiKutumbshastri, RashtriyaSanskrit Sansthanam, New Delhi Publication					
3.“India’s Glorious ScientificTradition” Suresh Soni, Ocean books (P) Ltd.,New Delhi					



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COURSE STRUCTURE & SYLLABI

AUDIT COURSE-II



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Course Code	PEDAGOGY STUDIES	L	T	P	C
21DAC201a		2	0	0	0
Semester		II			
Course Objectives: This course will enable students:					
- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers. - Identify critical evidence gaps to guide the development.					
Course Outcomes (CO): Student will be able to					
Students will be able to understand:					
- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries? - What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners? - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?					
UNIT - I					
Introduction and Methodology: Aims and rationale, Policy back ground, Conceptual frame work and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.					
UNIT - II					
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.					
UNIT - III					
Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.					
UNIT - IV					
Professional development: alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community. Curriculum and assessment, Barrier to learning: limited resources and large class sizes					
UNIT - V					
Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.					
Suggested Reading					
- Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261. - Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of					



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3. Curriculum Studies, 36 (3): 361-379.
4. AkyeampongK(2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
5. Akyeampong K, LussierK, PryorJ, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
6. Alexander RJ(2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
Chavan M (2003) ReadIndia: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.



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COURSE STRUCTURE & SYLLABI

Course Code	STRESSMANAGEMENT BY YOGA	L	T	P	C
21DAC201b		2	0	0	0
Semester		II			
Course Objectives: This course will enable students:					
- To achieve overall health of body and mind - To overcome stres					
Course Outcomes (CO): Student will be able to					
- Develop healthy mind in a healthy body thus improving social health also - Improve efficiency					
UNIT - I					
Definitions of Eight parts of yog.(Ashtanga)					
UNIT - II					
Yam and Niyam.					
UNIT - III					
Do`sand Don`t`s in life. i) Ahinsa,satya,astheya,bramhacharyaand aparigrahaii) Shaucha,santosh,tapa,swadhyay,ishwarpranidhan					
UNIT - IV					
Asan and Pranayam					
UNIT - V					
i)Variousyogposesand theirbenefitsformind &body ii)Regularizationofbreathingtechniques and its effects-Types ofpranayam					
Suggested Reading					
1.‘Yogic Asanas forGroupTarining-Part-I’: Janardan SwamiYogabhyasiMandal, Nagpur 2.“Rajayogaor conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata					



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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
21DAC201c		2	0	0	0
Semester		II			
Course Objectives: This course will enable students:					
- To learn to achieve the highest goal happily - To become a person with stable mind, pleasing personality and determination - To awaken wisdom in students					
Course Outcomes (CO): Student will be able to					
- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life - The person who has studied Geeta will lead the nation and mankind to peace and prosperity - Study of Neetishatakam will help in developing versatile personality of students					
UNIT - I					
Neetishatakam- Holistic development of personality Verses-19,20,21,22(wisdom) Verses-29,31,32(pride & heroism) Verses-26,28,63,65(virtue)					
UNIT - II					
Neetishatakam- Holistic development of personality Verses-52,53,59(dont's) Verses-71,73,75,78(do's)					
UNIT - III					
Approach to day to day work and duties. Shrimad Bhagwad Geeta: Chapter 2- Verses 41,47,48, Chapter 3- Verses 13,21,27,35, Chapter 6- Verses 5,13,17,23,35, Chapter 18- Verses 45,46,48.					
UNIT - IV					
Statements of basic knowledge. Shrimad Bhagwad Geeta: Chapter 2- Verses 56,62,68 Chapter 12 - Verses 13,14,15,16,17,18 Personality of Role model. Shrimad Bhagwad Geeta:					
UNIT - V					
Chapter 2- Verses 17, Chapter 3- Verses 36,37,42, Chapter 4- Verses 18,38,39 Chapter 18- Verses 37,38,63					
Suggested Reading					
1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department), Kolkata 2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P. Gopinath, Rashtriya Sanskrit Sansthanam, New Delhi.					



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COURSE STRUCTURE & SYLLABI

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M.TECH. IN COMPUTER SCIENCE AND ENGINEERING
COURSE STRUCTURE & SYLLABI

Course Code	INDUSTRIAL SAFETY	L	T	P	C
21DOE301b	(Common to M.Tech CSE, CN, SE, AI & ML)	3	0	0	3
Semester		III			
Course Objectives:					
- To know about Industrial safety programs and toxicology, Industrial laws , regulations and source models - To understand about fire and explosion, preventive methods, relief and its sizing methods - To analyse industrial hazards and its risk assessment.					
Course Outcomes (CO): Student will be able to					
- To list out important legislations related to health, Safety and Environment. - To list out requirements mentioned in factories act for the prevention of accidents. - To understand the health and welfare provisions given in factories act.					
UNIT - I		Lecture Hrs:			
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.					
UNIT - II		Lecture Hrs:			
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.					
UNIT - III		Lecture Hrs:			
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.					
UNIT - IV		Lecture Hrs:			
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.					
UNIT - V		Lecture Hrs:			
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance					
Textbooks:					
1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services. 2. Maintenance Engineering, H. P. Garg, S. Chand and Company.					
Reference Books:					
1. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication. 2. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.					



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COURSE STRUCTURE & SYLLABI

Course Code	BUSINESS ANALYTICS (Common to M.Tech CSE, CN, SE, AI & ML)	L	T	P	C
21DOE301c		3	0	0	3
	Semester	III			
Course Objectives:					
The main objective of this course is to give the student a comprehensive understanding of business analytics methods.					
Course Outcomes (CO): Student will be able to					
- Students will demonstrate knowledge of data analytics. - Students will demonstrate the ability of think critically in making decisions based on data and deep analytics. - Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making. - Students will demonstrate the ability to translate data into clear, actionable insights.					
UNIT - I		Lecture Hrs:			
Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.					
UNIT - II		Lecture Hrs:			
Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.					
UNIT - III		Lecture Hrs:			
Forming Requirements: Overview of Requirements, Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents. Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling					
UNIT - IV		Lecture Hrs:			
Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools					
UNIT - V		Lecture Hrs:			
Recent Trands in: Embedded and colleborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.					
Textbooks:					
- Business Analysis by James Cadle et al. - Project Management: The Managerial Process by Erik Larson and, Clifford Gray					
Reference Books:					
- Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press. - Business Analytcs by James Evans, persons Education.					



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COURSE STRUCTURE & SYLLABI

Course Code	OPTIMIZATION TECHNIQUES	L	T	P	C
21DOE301f	(Common to M.Tech CSE, CN, SE, AI & ML)	3	0	0	3
Semester		III			
Course Objectives:					
- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems. - Learn classical optimization techniques and numerical methods of optimization. - Know the basics of different evolutionary algorithms. - Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.					
Course Outcomes (CO): Student will be able to					
- Explain the fundamental knowledge of Linear Programming and Dynamic Programming problems. - Use classical optimization techniques and numerical methods of optimization. - Describe the basics of different evolutionary algorithms. - Enumerate fundamentals of Integer programming technique and apply different techniques to solve various optimization problems arising from engineering areas					
UNIT - I		Lecture Hrs:			
LINER PROGRAMMING (L.P): Revised Simplex Method, Dual simplex Method, Sensitivity Analysis DYNAMIC PROGRAMMING (D.P): Multistage decision processes. Concepts of sub optimization, Recursive Relation-calculus method, tabular method, LP as a case of D.P.					
UNIT - II		Lecture Hrs:			
CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization without constraints, Multi variable optimization without constraints, multivariable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions. NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead’s Simplex search method, Gradient of a function, Steepest descent method, Newton’s method					
UNIT - III		Lecture Hrs:			
MODERN METHODS OF OPTIMIZATION: GENETIC ALGORITHM (GA): Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, Random population generation. Fuzzy Systems: Fuzzy set Theory, Optimization of Fuzzy systems					
UNIT - IV		Lecture Hrs:			
INTEGER PROGRAMMING: Graphical Representation, Gomory’s Cutting Plane Method, Balas’ Algorithm for Zero–One Programming, Branch-and-Bound Method					
UNIT - V		Lecture Hrs:			
APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Formulation of model- optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.					
Textbooks:					
1. Engineering Optimization (4th Edition) by S.S.Rao, New Age International,					



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTHAPURAMU – 515 002 (A.P) INDIA

M.TECH. IN COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE & SYLLABI

Reference Books:

1. Optimization for Engineering Design by Kalyanmoy Deb, PHI Publishers
2. Genetic algorithms in Search, Optimization, and Machine learning – D.E.Goldberg, Addison-Wesley Publishers
3. Operations Research by Hillar and Liberman, TMH Publishers
4. Optimal design – Jasbir Arora, McGraw Hill (International) Publisher

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

Course Structure and Detailed Syllabi (2017-18 onwards)

Master of Business Administration

MBA Semester – I

S. No	Course code	Subject	L	T	P	C
1.	17E00101	Management & Organizational Behaviour	4	-	-	4
2.	17E00102	Business Environment & Law	4	-	-	4
3.	17E00103	Managerial Economics	4	-	-	4
4.	17E00104	Financial Accounting for Managers	4	-	-	4
5.	17E00105	Statistics for Managers	4	-	-	4
6.	17E00106	Management Information Systems	2	-	-	2
7.	17E00107	Information Technology for Managers	2	-	-	2
8.	17E00108	Communication Lab	-	-	3	2
9.	17E00109	Data Analytics Lab	-	-	3	2
		Total	24	-	6	28

MBA Semester – II

S. No	Course code	Subject	L	T	P	Credits
1.	17E00201	Human Resource Management	4		-	4
2.	17E00202	Marketing Management	4		-	4
3.	17E00203	Business Research Methods	4		-	4
4.	17E00204	Financial Management	4		-	4
5.	17E00205	Operations Research	4		-	4
6.	17E00206	Operations Management	4		-	4
7.	17E00207	Business Communication	2		-	2
8.	17E00208	Business Analytics Lab	-		3	2
9.	17E00209	Business Communication Lab	-		3	2
		Total	26		6	30

***Note: The student shall initiate project work immediately after II semester and evaluation shall take place in IV semester**

MBA Semester – III

S. No	Course code	Subject	L	T	P	C
1.	17E00301	Business Ethics & Corporate Governance	4	-	-	4
2.	17E00302	Green Business Management	4	-	-	4
3.	17E00303	Entrepreneurship Development	4	-	-	4
4.	17E00304 17E00305 17E00306 17E00307	Elective I Cost and Management Accounting Product and Brand Management Human Resource Development Mobile Commerce	4	-	-	4
5.	17E00308 17E00309 17E00310 17E00311	Elective II Financial Institutions and Services Consumer Behavior Labor laws and Legislation Supply Chain Management	4	-	-	4
6.	17E00312 17E00313 17E00314 17E00315	Elective III Investment and Portfolio Management Rural Marketing Performance Management Enterprise Resource Planning	4	-	-	4
7.	17E00316 17E00317 17E00318 17E00319	Elective IV Auditing and Taxation Advertising and Sales Promotion Management Knowledge Management Data warehousing and Mining	4	-	-	4
8.	17E00320	Business Simulation Lab	-	-	3	2
9.	17E00321	MOOCS	-	-	-	
		Total	28	-	3	30

MBA Semester – IV

S. No	Course code	Subject	L	T	P	C
1.	17E00401	Strategic Management	4	-	-	4
2.	17E00402	E-Business	4	-	-	4
3.	17E00403 17E00404 17E00405 17E00406	Elective V Financial Derivatives Services Marketing Organization Development Data Communication and Network Analysis	4	-	-	4
4.	17E00407 17E00408 17E00409 17E00410	Elective VI International Financial Management International Marketing Global Human Resource Management Corporate Information Management	4	-	-	4
5.	17E00411	Seminar (Contemporary Issues on Business)	-	-	3	2
6.	17E00412	Project Work	-	-	12	10
		Total	16	-	15	28

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MBA I Semester

L	T	P	C
4	0	0	4

(17E00101) MANAGEMENT & ORGANIZATIONAL BEHAVIOUR

Objective of the course is to give a basic perspective of Management theories and Practices. This will form foundation to study other functional areas of management and to provide the students with the conceptual framework and the theories underlying Organisational Behaviour.

1. Role of Management – Concept – Significance – Functions – Principles of Management - Patterns of Management: Scientific – Behavioural – Systems – Contingency.

2. Decision Making & Controlling – Process – Techniques. Planning – Process – Problems — Making It Effective. Controlling - System of Controlling – Controlling Techniques – Making Controlling Effective

3. Individual Behaviour & Motivation – Understanding Individual Behaviour – Perception – Learning – Personality Types – Johari window- Transactional Analysis- Motivation – Concept of Motivation - Motivational Theories of Maslow, Herzberg, David Mc Clelland, and Porter and Lawler

4. Group Behavior & Leadership: Benefits of Groups – Types of Groups – Group Formation and Development. Leadership and Organizational Culture and Climate: Leadership – Traits Theory – Managerial Grid – Transactional Vs Transformational Leadership – Qualities of good leader- Women Leadership in India.

5. Organisational Behaviour—Organizing Process – Departmentation Types – Making Organizing Effective – Organisational culture- Types of culture – Organisational Culture Vs Organisational climate - Conflict management - Change Management

Textbooks:

- Organisational Behaviour, Stephen P. Robbins, Pearson Education
- Management and Organisational Behaviour, Subbarao P, Himalaya Publishing House
- Principles of Management, Koonz, Weihrich and Aryasri, Tata McGraw Hill.

References:

- Organisational Behaviour ,S.S.Khanka, S.Chand
- Organisational Behaviour , Mishra .M.N ,Vikas
- Management and Organisational behaviour, Pierce Gordner, Cengage.
- Behaviour in Organizations, Hiriappa .B.New Age Publications
- Organisational Behaviour, Sarma, Jaico Publications.
- Principles of Management ,Murugesan ,Laxmi Publications

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
MBA I Semester

L	T	P	C
4	0	0	4

(17E00102) BUSINESS ENVIRONMENT AND LAW

The objective of the course is to provide the student with a background of various environment factors that have major repercussions on business and sharpen their mind to watch and update the changes that occur constantly in this sphere.

1. **Introduction to Business Environment:-** Meaning, Components of Business Environment.-Industrial policy of 1991, Liberalization, Privatization and Globalization
2. **Monetary, Fiscal and Trade Policy:** Monetary & Fiscal Policy – EXIM Policy, Role of EXIM Bank. Balance of Payments: **WTO:** Role and functions of WTO in promoting world trade – TRIPS, TRIMS and GATS, - Dumping and Anti-dumping measures.
3. **Law**-Definition -Need, classification and sources of Business Law, Law of Contract - 1872 (Part-I): Nature of Contract and essential elements of a valid Contract, Offer and Acceptance. Law of Contract – 1872 (part-II): Consideration, Capacity to Contract and free consent, Legality of the object.
4. **Companies Act, 1956 (Part-I):** Kinds of Companies, Formulation of Companies, Incorporation, Company Documents. **Company Act, 1956 (Part-II):** Company Management, Directors, Company meetings, Resolutions, Auditors, Modes of Winding-up of a company.
5. **Information Technology Act, 2000:** Scope and Application of IT Act, 2000- Digital signature e-governance, penalties and adjudication, cyber regulations appellate, tribunals, duties of subscribers - Right to Information Act, 2005 – GST Act 2017.

Textbooks:

- Essentials of Business Environment, K.Aswathappa, Himalaya publishers.
- Mercantile Law - N.D.Kapoor, Sultan Chand & Sons.
- Mechantile Law- Garg, Sareen, Sharma, Chawla, Kalyani publishers.

References:

- Indian Economy, Dutt and Sundaram, S. Chand, New Delhi.
- Business Environment – Text and Cases, Justin Paul, TMH.
- Indian Economy- Misra and Puri, Himalaya.
- Business Environment, Suresh Bedi, Excel.
- Mercantile Law, S.S. Gulshan, 3/e, Excel Books,
- Legal Aspects of Business, Ravinder Kumar, Cengage.
- *A Manual of Business Laws*, S.N.Maheshwari & Maheshwari, Himalaya.
- Business law for management, K.R.Bulchandani-Himalaya Publishing.
- Business law, R.S.N Pillai, Bhagavathi, S.Chand

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MBA I Semester

L	T	P	C
4	0	0	4

(17E00103) MANAGERIAL ECONOMICS

Objective of this course is to understand the relevance of economics in business management. This will enable the students to study functional areas of management such as Marketing , Production and Costing from a broader perspective.

1. **Introduction to Managerial Economics:** Definition, Nature and Scope, Relationship with other areas in Economics, Production Management, Marketing, Finance and Personnel, Operations research - The role of managerial economist. Objectives of the firm: Managerial theories of firm, Behavioural theories of firm, optimization techniques, New management tools of optimization.
2. **Theory of Demand:** Demand Analysis – Law of Demand - Elasticity of demand, types and significance of Elasticity of Demand. Demand estimation – Marketing research approaches to demand estimation. Need for forecasting, forecasting techniques.
3. **Production Analysis:** Production function, Isoquants and Isocosts, Production function with one/two variables, Cobb-Douglas Production Function, Returns to Scale and Returns to Factors, Economies of scale- Cost concepts - cost-output relationship in the short run and long run, Average cost curves - Break Even Analysis.
4. **Market Structure and Pricing practices:** Features and Types of different competitive situations - Price-Output determination in Perfect competition, Monopoly, Monopolistic competition and Oligopoly. Pricing philosophy – Pricing methods in practice: Price discrimination, product line pricing. Pricing strategies: skimming pricing, penetration pricing, Loss Leader pricing. Pricing of multiple products.
5. **Inflation and Business Cycles:-**Definition and meaning-characteristics of Inflation-types of inflation - effects of inflation - Anti-Inflationary methods - Definition and characteristics of business cycles-phases of business cycle - steps to avoid business cycle

Textbooks:

- Managerial Economics -Analysis, Problems ,Cases ,Mehta,P.L., Sultan Chand & Sons.
- Managerial Economics, Gupta, TMH

References:

- Managerial Economics, D.N.Dwivedi,Eighth Edition,Vikas Publications
- Managerial Economics, Pearson Education, James L.Pappas and Engene F.Brigham
- Managerial Economics, Suma Damodaran, Oxford.
- Macro Economics by MN Jhingan-Oxford
- Managerial Economics- Dr.DM.Mithani-Himalaya Publishers
- Managerial Economics-Dr.H.L Ahuja-S.Chand and Com pvt ltd, NewDelhi
- Managerial Economics by Dominick Salvatore, Ravikesh Srivastava- Oxford University press.
- Managerial Economics by Hirschey- Cengage Learning

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
MBA I Semester

L T P C
4 0 0 4

(17E00104) FINANCIAL ACCOUNTING FOR MANAGERS

The Objective of the course is to provide the basic knowledge of book keeping and accounting and enable the students to understand the Financial Statements and make analysis financial accounts of a company.

*** Standard discounting and statistical tables to be allowed in the examinations.**

1. **Introduction to Accounting:** Definition, Importance, Objectives, uses of accounting and book keeping Vs Accounting, Single entry and Double entry systems, classification of accounts – rules of debit & credit.
2. **The Accounting Process:** Overview, Books of Original Record; Journal and Subsidiary books, ledger, Trial Balance, Final accounts: Trading accounts- Profit & loss accounts- Balance sheets with adjustments, accounting principles.
3. **Valuation of Assets:** Introduction to Depreciation - Methods (Simple problems from Straight line method, Diminishing balance method and Annuity method). Inventory Valuation: Methods of inventory valuation (Simple problems from LIFO, FIFO, Valuation of goodwill - Methods of valuation of goodwill.
4. **Financial Analysis -I** Analysis and interpretation of financial statements from investor and company point of view, Liquidity, leverage, solvency and profitability ratios – Du Pont Chart -A Case study on Ratio Analysis
5. **Financial Analysis-II:** Objectives of fund flow statement - Steps in preparation of fund flow statement, Objectives of Cash flow statement- Preparation of Cash flow statement - Funds flow statement Vs Cash flow statement.

Textbooks:

- Financial Accounting, Dr.S.N. Maheshwari and Dr.S.K. Maheshwari, Vikas Publishing House Pvt. Ltd.,
- Accountancy .M P Gupta & Agarwal ,S.Chand

References:

- Financial Accounting , P.C.Tulisan ,S.Chand
- Financial Accounting for Business Managers, Asish K. Bhattacharyya, PHI
- Financial Accounting Management An Analytical Perspective, Ambrish Gupta, Pearson Education
- Accounting and Financial Management, Thukaram Rao, New Age Internationals.
- Financial Accounting Reporting & Analysis, Stice & Stice, Thomson
- Accounting for Management, Vijaya Kumar,TMH
- Accounting for Managers, Made Gowda, Himalaya
- Accounting for Management , N.P.Srinivasan, & M.Shakthivel Murugan, S.Chand

(17E00105) STATISTICS FOR MANAGERS

The objective of this course is to familiarize the students with the statistical techniques popularly used in managerial decision making. It also aims at developing the computational skill of the students relevant for statistical analysis.

1.Introduction of statistics – Nature & Significance of Statistics to Business, , Measures of Central Tendency- Arithmetic – Weighted mean – Median, Mode – Geometric mean and Harmonic mean – Measures of Dispersion, range, quartile deviation, mean deviation, standard deviation, coefficient of variation – Application of measures of central tendency and dispersion for business decision making.

2. Correlation: Introduction, Significance and types of correlation – Measures of correlation – Co-efficient of correlation. Regression analysis – Meaning and utility of regression analysis – Comparison between correlation and regression – Properties of regression coefficients- Rank Correlation.

3. Probability – Meaning and definition of probability – Significance of probability in business application – Theory of probability –Addition and multiplication – Conditional laws of probability – Binominal – Poisson – Uniform – Normal and exponential distributions.

4. Testing of Hypothesis- Hypothesis testing: One sample and Two sample tests for means and proportions of large samples (z-test), One sample and Two sample tests for means of small samples (t-test), F-test for two sample standard deviations. ANOVA one and two way .

5. Non-Parametric Methods: Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes - Sign test for paired data.

Textbooks:

- Statistical Methods, Gupta S.P., S.Chand. Publications

References:

- Statistics for Management, Richard I Levin, David S.Rubin, Pearson,
- Business Statistics, J.K.Sharma, Vikas house publications house Pvt Ltd
- Complete Business Statistics, Amir D. Aezel, Jayavel, TMH,
- Statistics for Management, P.N.Arora, S.Arora, S.Chand
- Statistics for Management , Lerin, Pearson Company, New Delhi.
- Business Statistics for Contemporary decision making, Black Ken, New age publishers.
- Business Statistics, Gupta S.C & Indra Gupta, Himalaya Publishing House, Mumbai

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MBA I Semester

L	T	P	C
2	0	0	2

(17E00106) MANAGEMENT INFORMATION SYSTEM

The objective of the course is to provide the basic concepts of systems concepts and Management of Information System and utility of the systems for the managerial decisions.

1. **MIS An overview** - Introduction, Need for MIS and IT nature and scope of MIS, MIS characteristics, Structure of MIS, role of MIS in global business. Challenges of Managing MIS.

2. **Data resource management** - Data base concepts, The traditional approaches, the modern approaches (Data base management approaches) DBMS, Data models, Data ware housing and mining.

3. **Business application of IS** - Enterprise systems, ERP, CRM, SCM, DSS, Types of decisions, Decision support techniques, Decision making and Role of MIS, Business intelligence and Knowledge management systems.

4. **Management of IS** - Project planning, SDLC, System development models, Project management, system analysis, system design, Implementation process, Product based MIS evaluation, Cost /Benefit based evaluation, Process based calculation, System maintenance.

5. **Security, Ethical & Social Issues** : IS security threats, Protecting IS, IS Security Technologies, The disaster recovery plan, IS Ethical Issues, social issues.

Textbook:

- MIS –Managerial Perspective, D.P.Goyal,Vikas Publications.

References:

- Management Information Systems, C Laudon and Jane P.Laudon, et al, Pearson Education.
- MIS, Hossein Bidgoli, Nilanjan Chattopadhyay, Cengage Learning
- Management Information Systems Text & Cases, W S Jawadekar, Tata McGraw-Hill.
- Introduction to Information Systems, Rainer, Turban, Potter, WILEY-India.
- Management Information Systems, James A. Obrein, Tata McGraw-Hill .
- Management Information Systems, Dharminder and Sangeetha, 1/e, Excel books.
- Cases in MIS, Mahapartra, PHI.
- Management Information Systems, Gordon B. Davis & Margrethe H.Olson, Tata McGraw-Hill

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MBA I Semester

L	T	P	C
2	0	0	2

(17E00107) INFORMATION TECHNOLOGY FOR MANAGERS

The main objective of this course is to make the student familiarize in information technology and their applications to business processes.

1. **Fundamentals of IT:-** Components of a system - Meaning and nature – Role of IT in various sectors - Information technology management - Strategies for gaining IT advantage.
2. **Database Management Systems:** Introduction to DBMS - Applications to data base - concepts, data access methods – Types of data processing-data base languages
3. **Understanding Ms-Office:-** MS-Word - MS-Excel - Formulae, Graphs, Basis Statistical Formulae, MS-Access, MS-PowerPoint - Creating Effectiveness presentations.
4. **Data Communication and Networks:** Concepts of Data Communication, Types of Data-Communication Networks, Communications Media, Concepts of Computer Networks, the Internet, Intranet and Extranets: Operation of the Internet, Services provided by Internet, World Wide Web.
5. **Emerging Trends in IT:** Introduction to SAP, IP addresses, IP protocol, various ERP packages, Implementation of ERP - Introduction to big data - cloud computing

Textbooks:

- Fundamentals of Information Technology, Alexis Leon, & Mathews Leon - Vikas.

References:

- Basics of Computer Sciences, Behrouz Forouzan, Firoz Mosharraf, Cengage.
- Information Technology for Management, Ramesh Behi, Mc Graw Hill.
- Introduction to Computers and Communications, Peter Norton-Sixth Edition-Tata McGraw Hill.
- V.Rajaraman, Introduction to Information Technology, Prentice Hall India.
- Information Technology and theory Aksoy, Cengage Learnings.
- Foundations of IT,Dhiraj Sharma, Excel Books.
- MS Office 2000 for every one, Sanjay Saxena – Vikas

(17E00108) COMMUNICATION LAB

Objective: The introduction of Communication Lab is considered essential at I year II semester level. At this stage the students need to prepare themselves for their careers which may require them to listen, to read, speak and write in English both for their professionals and interpersonal communication in the globalised context.

1. **Understanding the need of Communication Skills** for Managers and the importance of effective communication, role play activities and case study analysis
2. **Phonetics** – Introduction to sounds of speech, vowels and consonants, phonetic transcription, orthographic transcription, syllabification, word stress, Innovation, Accent, Rhythm and Situational Dialogues
3. **Listening exercises** - listening with a focus on pronunciation (ear training): segmental sounds, stress, weak forms, intonation - listening for meaning (oral comprehension) : listening to talks, lectures, conversations, discussions, jokes, riddles etc.
4. **Speaking Skills** –Expressing opinions, Telephone conversations, PPT Presentations, Poster Presentations, Welcome Address (Inviting Dignitaries to department workshops, symposiums and university functions), proposing vote of thanks and Mock Interviews.
5. **Writing and Reading exercises:-** Reading and writing comprehensions, Note making after reading a text, showing the main idea and supporting ideas and the relationships between them -Practice in writing paragraphs, short essays and summaries etc.

Note :- 1) K-Van Solutions-Advanced communication Lab
2) Sky pronunciation for Phonetics.

Reference Books:

- Basic Business Communication Skills for empowering the internet generation, LesikarFlatley, Tata McGraw Hill.
- Business Communication for Managers, Penrose, Rasberry and Myers, Cengage.
- A Text Book of English Phonetics for Indian Students by, T.Balasubramanian, McMillan.
- Oxford Advanced Learner's Dictionary.
- BCOM, Mala Sinha, Cengage
- Business Communication, Bovee, Pearson.
- Business Communication, Locker, Kaczmarek, Tata McGraw Hill.
- Speaking and Writing for Effective Business Communication, Francis, MacMillan India Ltd.
- Business Communication, Asha Kaul, PHI.
- Speaking about Science, A manual for creating clear presentations, Scott Morgan and BarretWhitner, CUP.
- The Ace of Soft Skills, Gopal Ramesh and Mahadevan Ramesh, Pearson Education.
- From Campus to Corporate, Ramachandran KK and Karthcik KK, MacMillan India Ltd.
- Body Language – Your success mantra, Dr. ShaliniVarma, S Chand

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MBA I Semester

L T P C
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(17E00109) DATA ANALYTICS - LAB

The Objective of the course is to provide basic understanding of applications of information technology and hands on experience to students in using computers for data organization and addressing business needs.

The Experiments may be devised as per the following requirements

1. **MS-Word**-Creation of Document- Format Document-Text editing and saving- Organising information with tables and outlines-Mail merge-Publishing documents on Web. **MS Power Point**-Creation of slides-Use of templates and slide designs for creating power point slides- use of drawings and graphics. Developing a Professional presentation on Business Plans, Institutions, Products, People etc
2. **MS Excel**-Creating and editing worksheets-Cell formatting-Creating and using formulas and functions-Use of Macros –Sorting and querying data-Working with graphs and charts
3. **Sample test for means**-T-test, Z-test, ANOVA, one way, two way..
4. **Correlation**-Significance and application, Pearson & Spearman Correlation
5. **Regression**-Simple linear regression, Multiple regression.

References:

- Cox et al- 2007 Microsoft Office System Step-by- Step, First Edition, PHI.
- David Whigam-Business Data Analysis Using Excel, First Edition, Oxford University Press.
- Alexisleon, TMH, 2008, Enterprise resource planning.
- The Oxford Hand Book of Internet studies, William.H.Dulton, Oxford.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
MBA II Semester

L	T	P	C
4	0	0	4

(17E00201) HUMAN RESOURCE MANAGEMENT

The objective of the course is to provide basic knowledge of functional area of Human Resource Management. This will be the prerequisite for enabling students to take any HRM stream electives offered in third and fourth semesters.

1. **Introduction:-** Meaning of HR and HRM, Nature & Scope of HRM, Functions of HRM, Role and Objectives of HRM, Personnel Management, Policies and Strategies of HRM.
2. **Designing and Developing HR systems:-** Human Resource Planning, Job Design, Job Analysis, Job Evaluation, Job Enlargement, Job Enrichment, Job Rotation, Recruitment & Selection, Placement, Promotion & Transfer.
3. **Compensation Management:-** Introduction, objectives of wages and salaries administration, influencing factors for determining compensation- Monetary and non monetary benefits.
4. **Human Resource Development:-** Concepts, Development Function, Training and Development, Performance Appraisal & Career Planning and Development.
5. **Recent Trends in HRM:** Outsourcing, Work Life Balance, Quality Circles and Total Quality Management.

Textbooks:

- Personnal and Human Resource Management – Text and cases, P. Subbarao, Himalaya.
- Human Resource Management, Noe A.Raymond, John Hollenbeck, Barry Gerhart and Patrick Wright, Tata McGraw Hill.

References

- Human Resource Management, Aswathappa, 4th Edition, TMH 2006
- Human Resource Mangement, Ian Beardwell & Len Holden-Macmillan India Ltd.
- Managing Human Resources: Productivity, quality of work life, profits- Wayne F. Cascio TMH.
- Strategies HRM by Rajeev Lochan Dhar, Excel Books.
- Human Resource Management, Text and Cases, VSP Rao, Excel Books 2006.

(17E00202) MARKETING MANAGEMENT

The objective of the course is to have the basic concepts of Marketing which is one of the important areas of functional management. This is a pre-requisite for taking up any elective paper in 3rd and 4th semester in the stream of Marketing.

- 1. Understanding Marketing Management:** Concepts of Marketing, Marketing Strategies & Plans, Creating long term loyalty relationships, Marketing mix, PLC, Analyzing Competitors ,Conducting Marketing research.
- 2. Connecting with Customers & Building Strong Brands:** Analyzing Consumer Markets, Analyzing Business Markets, Tapping into global markets, Identifying market segments and targets, Crafting Brand Positioning, Creating Brand Equity-Addressing Competition and driving growth.
- 3. Creating & Communicating Value:-** Setting product strategy, Designing & managing services, Introducing new market offerings. Developing pricing strategies & programmes. Designing & Managing Integrated Marketing Communications, Advertising & Sales Promotions, Events and experiences, Managing digital communication - online, social media & mobile, Personal selling.
- 4. Delivering Value :-** Managing retailing, wholesaling and logistics. Designing and Managing Integrated Marketing Channels
- 5. Sales Management:-** Nature & Importance of Sales Management, Skills of sales manager, Sales objectives, Concepts of sales organization, Types of sales organization.

Textbooks:

- Marketing Management, Phillip Kotler, Kevin Lane Keller, 15th edition ,Pearson.

References:

- Marketing, A South Asian Prospective, Lamb, Hair, Sharma, Mcdaniel, Cengage .
- Marketing Asian Edition Paul Baines Chris Fill Kelly page, Oxford.
- Marketing Management 22e, Arun Kuar, Menakshi, Vikas publishing .
- Marketing in India, Text and Cases, S.Neelamegham, Vikas .
- Marketing Management, Rajan Saxena, TMH.
- Marketing – The Core, Kerin, Hartley and Rudelius, McGraw Hill, Irwin.
- Case Studies in Marketing, The Indian Context, Srinivasan, PHI.
- Marketing Management, V.S. Ramaswamy and S. Namakumari, McMillan.
- Marketing – concepts and Cases, Etzel, Walker, Stanton, Pandit, TMH.
- Introduction to Marketing theory and practice, Adrian Palmer , Oxford University Press

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
MBA II Semester

L	T	P	C
4	0	0	4

(17E00203) BUSINESS RESEARCH METHODS

Objective of the course is to have a general understanding of statistics as applicable to business and its use in areas of management research. The Course addresses the methods of research with an emphasis on various stages that are necessary to obtain and process information to enable well informed decision-making. It allows the students to grasp and comprehend the methods and techniques used in research and provide with the knowledge and skill to undertake research.

***Standard Statistical tables shall be allowed in the examination**

1. **Introduction to Business Research:** Definition-Types of Business Research. Scientific Investigation, Technology and Business Research: Information needs of Business - Technologies used in Business Research: The Internet, E-mail, Browsers and Websites. Role of Business Research in Managerial Decisions.
2. **The Research Process:** Problem Identification: Broad Problem Area-Preliminary Data Gathering. Literature Survey - Hypothesis Development - Statement of Hypothesis- Procedure for Testing of Hypothesis. The Research Design: Types of Research Designs: Exploratory, Descriptive, Experimental Designs and Case Study - Measurement of Variables- Operational Definitions and Scales-Nominal and Ordinal Scales- Rating Scales- Ranking Scales- Reliability and Validity - Sampling and Methods of sampling
3. **Collection and Analysis of Data** Sources of Data-Primary and Secondary Sources of Data - Data Collection Methods- Interviews: Structured Interviews and Unstructured Interviews- Observational Surveys: Questionnaire Construction: Organizing Questions- Structured and Unstructured Questionnaires – Guidelines for Construction of Questionnaires.
4. **Data Analysis:** An overview of Descriptive, Associational and Inferential- Statistical Measures.
5. **The Research Report:** Research Reports-Components-The Title Page-Table of Contents-The Executive Summary-The Introductory Section-The Body of the Report-The Final Part of the Report- Acknowledgements – References-Appendix - Guidelines for Preparing a Good Research report - Oral Presentation

Textbooks:

- Research Methodology – methods & Techniques, C.R. Kothari, Vishwa prakashan.
- Research Methods for Business–A Skill Building Approach, Uma Sekaran, John Wiley & Sons (Asia) Pte.Ltd, Singapore.
- Research Methodology(Concepts and cases) Deepak Chawla Neena Sondhi-Vikas publishing
- Business Research Methods 8e, Zikmund- Babin-Carr- Adhikari-Griffin-Cengage learning.

References:

- Business Research Methods, Donald R Cooper and Pamela S Schindler,9/e,Tata McGraw-Hill Publishing Company Limited.
- Methodology and Techniques of Social Science Research, Wilkinson & Bhandarkar, Himalaya Publishing House.
- An Introduction to Management for Business Analysis, Speegal, M.R., McGraw Hill
- Research Methodology in Management, Michael, V.P., Himalaya Publishing House.
- Research Methodology, Dipak Kumar. Bhattacharya, Excel Books.
- Research Methodology (Concepts and cases) Deepak Chawla Neena Sondhi-Vikas publishing.
- Business Research Methods- Alan Broman, Emma Bell 3e, Oxford university
- Research Methodology ,Dr.Vijay Upagade and Dr.Aravind Shende

(17E00204) FINANCIAL MANAGEMENT

The objective of the course is to provide the necessary basic tools for the students so as to manage the finance function. The students should be able to understand the management of the financing of working capital needs and the long term capital needs of the business organization

*** Standard Discounting Table and Annuity tables shall be allowed in the examination**

- 1. The Finance function:** Nature and Scope. Importance of Finance function – The role in the contemporary scenario – Goals of Finance function; Profit Vs Wealth maximization .
- 2. The Investment Decision:** Investment decision process – Project generation, Project evaluation, Project selection and Project implementation. Capital Budgeting methods– Traditional and DCF methods. The NPV Vs IRR Debate.
- 3. The Financing Decision:** Sources of Finance – A brief survey of financial instruments. The Capital Structure Decision in practice: EBIT-EPS analysis. Cost of Capital: The concept, Measurement of cost of capital – Component Costs and Weighted Average Cost. The Dividend Decision: Major forms of Dividends
- 4. Introduction to Working Capital:** Concepts and Characteristics of Working Capital, Factors determining the Working Capital, Working Capital cycle- Management of Current Assets – Cash, Receivables and Inventory, Financing Current Assets
- 5. Corporate Restructures:** Corporate Mergers and Acquisitions and Take-overs-Types of Mergers, Motives for mergers, Principles of Corporate Governance.

Textbooks:

- Financial management –V.K.Bhalla ,S.Chand
- Financial Management, I.M. Pandey, Vikas Publishers.
- Financial Management--Text and Problems, MY Khan and PK Jain, Tata McGraw- Hill

References

- Financial Management , Dr.V.R.Palanivelu , S.Chand
- Principles of Corporate Finance, Richard A Brealey etal., Tata McGraw Hill.
- Fundamentals of Financial Management, Chandra Bose D, PHI
- Financial Managemen , William R.Lasheir ,Cengage.
- Financial Management – Text and cases, Bringham & Ehrhardt, Cengage.
- Case Studies in Finance, Bruner.R.F, Tata McGraw Hill, New Delhi.
- Financial management , Dr.M.K.Rastogi ,Laxmi Publications

(17E00205) OPERATIONS RESEARCH

The objective of the course is to provide the basic tools of Operations Research in solving the management problems through modeling and using mathematical approach.

1. **Introduction to OR: Meaning**, Nature, Scope & Significance of OR - Typical applications of Operations Research.

The Linear Programming Problem – Introduction, Formulation of Linear Programming problem, Limitations of L.P, Graphical solution to L.P.P, Simplex Method, Artificial Variable techniques, Two Phase Method, Variants of the Simplex Method.

2. **Transportation Problem:** Introduction, Transportation Model, Finding initial basic feasible solutions, Moving towards optimality, Unbalanced Transportation problems, Transportation problems with maximization, Degeneracy.

Assignment Problem – Introduction, Mathematical formulation of the problem, Solution of an Assignment problem, Hungarian Algorithm, Multiple Solution, Unbalanced Assignment problems, Maximization in Assignment Model.

3. **Sequencing** – Job sequencing, Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, n jobs through m machines, Two jobs and m Machines Problems.

4. **Game Theory:** Concepts, Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Mixed Strategy Games (Game without Saddle Point), Significance of Game Theory in Managerial Application.

5. **Project Management:** Rules for drawing the network diagram, Application of CPM and PERT techniques in Project Planning and Control.

Textbooks:

- Operations Research / S.D.Sharma-Kedarnath

References:-

- Introduction to O.R/Hiller & Libermann (TMH).
- Operations Research /A.M.Natarajan,P.Balasubramani,A. Tamilarasi/Pearson Education.
- Operations Research: Methods & Problems / Maurice Saseini, Arhur Yaspan & Lawrence Friedman. Pearson
- Quantitative Analysis For Management/ Barry Render, Ralph M. Stair, Jr and Michael E. Hanna/
- Operations Research / R.Pannerselvam, PHI Publications.
- Operations Research / Wagner/ PHI Publications.

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(14E00206) OPERATIONS MANAGEMENT

The Objective of the course is to enable students to understand the production Planning and Controlling aspects of a typical production and operations organization. To study understand the concepts of work study and Quality management.

1. Introduction: Overview of Production and Operations Management (POM) Function, Historical Development of POM, POM scenario Today. Product and Process Design - Product and Process Development, Manufacturing Process Technology, CAD/CAM analysis

2. Facilities Management & Aggregate Planning: Location of Facilities, Layout of Facilities, Optimization of Product/Process Layout, Flexible Manufacturing and Group Technology: Aggregate Planning - Preparation of Aggregate Demand Forecast, Specification of Organisational Policies For Smoothing, Capacity Utilization, Determination of feasible Production Alternatives

3. Scheduling : Scheduling In Job, Shop Type Production, Shop- Loading, Assignment and Sequencing, Scheduling In Mass, Line of Balance, Methods of Production Control ,World class production

4. Work Study & Quality Management : Method Study, Work measurement, Work Design, Job Design, Work Sampling, Industrial Engineering Techniques. Economics of Quality Assurance Inspection and Quality Control, Acceptance Sampling, Theory of control charts, control charts for variables and control charts for attributes

5. Materials Management: Introduction, Objectives, Importance of Materials Management- Issues in Materials Management – Functions – Activities –Selection of Materials-Advantages of Materials Management.

Textbooks:

- Production and Operation Management, Aswathappa K- Himalaya Publishing House
- "Production and Operations Management" - Dr. K. Sai Kumar, Kalyani Publishers

References:

- Operations Management and control, Biswajit Banerjee-S.Chand.
- Production and Operations Management –Dr.K.C.Arora ,2nd Edition- University Science Press.
- Production and Operations Management, R. Panneerselvam: PHI Learning Private Ltd.
- Production Management , Martand T Telsang-S.Chand
- Modern Production/Operations Management, Elwood S.Buffa and Rakesh K.Sarin,Wiley ..
- Production and Operations Management, SN Chary, Tata McGraw Hill, New Delhi.
- Operations Management, Mahadevan, Pearson Education, New Delhi.
- Production and Operations Management-Text and Cases, Upendra Kachru, Excel Books.

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(17E00207) BUSINESS COMMUNICATION

The objective of this Course is to understand the communication concepts and to develop the students' competence in communication at an advanced level. Assuming that the students are fairly proficient in the basic communication skills of listening, speaking, reading and writing in English the course aims to train them in communicating efficiently in the workplace and professional contexts.

1. Concept of Communication – Significance, Scope – Communication Process – Essentials of good communication – Channels of Communication – Formal, Informal Communication – Upward, Downward, Horizontal Communication.

2. Types of communication: Verbal – Oral Communication: Advantages and Limitations of Oral Communication, Written Communication – Characteristics, Advantages & Limitations **Non verbal Communication:** Sign language – Body language – Kinesics – Proxemics – Time language and Haptics: Touch language.

3. Interpersonal Communication: Communication Styles, Managing Motivation to Influence Interpersonal Communication – Role of emotion in Inter personal Communication.

4. Barriers of Communication: Types of barriers – Technological – Socio-Psychological barriers – Overcoming barriers, Types of listening.

5. Report writing – Formal reports – Writing effective letters – Different types of business letters - Interview techniques – Communication etiquettes

Text Books:

- Business Communication, C.S.Rayudu, HPH.
- Business Communication, Meenakshi Raman, Oxford University Press.

References:

- Business communication, Shalini Varma, Vikas.
- Business Communication, Raymond V.Lesikar, Neeraja Pandit et al.,TMH
- English for Business Communication, Dr.T.M Farhatulla, Prism books Pvt. Ltd.
- Business Communications, Hudson, Jaico Publications
- Business communication for managers, Penrose, Raspbery, Myers, Cengage
- The Skills of Communication, Bills Scot, Gower publishing company Limited, London.
- Effective Communication, Harward Business School, Harward Business Review No.1214.
- Essentials of Business Communication, Rajendra Pal, JS.Korlahhi, S.Chand

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(17E00208) BUSINESS ANALYTICS LAB

Objective: To make the students apply information systems in business areas.

1. **Accounting-** Creation of company, Preparation of Ledger, Posting Trial Balance, Profit and loss account, Balance sheet(Sole Traders).
2. **Finance:-** Capital Budgeting decisions, Calculations of NPV, IRR, Profitable Index , preparation of budget, Calculation of cost of capital.
3. **Marketing:-** Storing and Retrieving of data of customers, sales, dealers, products and geographical areas(Tables and graphs).
4. **Human Resource Management:-** Employees data base and Salary Administration.
5. **Systems:-** Understanding Information Systems , Design of MIS , Internet and Internet tools.

Note:- The programmes have to be taught to the students using MS Excel, Access, Power Point and Accounting packages. SPSS

References:

- Ms Office-Sanjay Saxena
- Ms Office Excel-Frye, PHI publications
- Ms Office Access- Step by step, PHI publications
- Reading material on accounting packages.
- SPSS User manual

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(17E00209) BUSINESS COMMUNICATION LAB

Aim: Aim is to enable students understand how to write business letters and improve Written Communication

Learning Outcome: At the end of the course, students will be enabled with the following skills.

- a. English language skills for effective written business communication ('s).
- b. Will be able to understand how to write project report.

1. Business Writing: Introduction, Importance of Written Business Communication, Direct and Indirect Approach to Business Messages, Five Main Stages of Writing Business Messages. Practice Exercises.

2. Business Correspondence: Introduction, Business Letter Writing, Effective Business Correspondence, Components of Business Letters, Kinds of Business Letters, Writing Effective Memos. Practice Exercises.

3. Instructions: Introduction, Written Instructions, General Warning, Caution and Danger, Oral Instructions. Practice Exercises.

4. Business Reports and Proposals: Meaning of Reports, Parts of a Report, Steps in writing an effective Business Report

5. Careers and Resumes: Introduction, Career Building, Electronic and Video Resumes and Write your resume to market yourself.

Textbook :

- Meenakshi Raman and Prakash Singh, Business Communication, Oxford.
- Lesikar: Basic Business Communication, TMH.

References:

- Stephen Bailey, Academic Writing for International Students of Business, Routledge.
- David Irwin: Effective Business Communications, Viva-Thorogood.
- Rajendra Pal, J S KorlahaHi: Essentials of Business Communication: Sultan Chand & Sons,
- Sailesh Sengupta, Business and Managerial Communications, PHI.

(17E00301) BUSINESS ETHICS AND CORPORATE GOVERNANCE

Objective: The objective of the course is to make students aware of ethical and moral issues concerning business both in Indian and International context and develop sensitivity of students for right ethical practices in conduct of business, to understand the principles of corporate governance, to know the social responsibility of the corporate.

- 1. Business Ethics and Corporate Ethics** – Meaning, Importance, Functions, Unethical Practises and Ethical dilemma, Ethical theories and Approaches, Modern Decision making - Ethical Models for Decision Making, Indian Ethos, Ethics for Managers, Ethics in Business Competition.
- 2. Ethical Aspects in Organisation – I:** Marketing ethics and Consumer ethics – Ethical issues in Advertising, Criticisms in Marketing ethics, Ethics in HRM: Selection, Training and Development – Ethics at work place – Ethics in Performance Appraisal.
- 3. Ethical Aspects in Organisation – II:** Ethics in Finance: Insider trading - Ethical investment - Combating Frauds. Ethical issues in Information Technology: Information Security and Threats – Intellectual Property Rights – Cyber crime.
- 4. Corporate Governance:** Purpose – Theories and Philosophies of Corporate Governance
- 5. Corporate Governance Structures:** Directors, Committees, Institutional investors – Auditors. Corporate Social Responsibility: Stakeholders – Environment – social Development.

TextBook :

- Business Ethics and Corporate Governance – A.C. Fernando, Pearson Education.

References:

- “Perspectives in Business Ethics”, Laura P Hartman, Tata McGraw Hill.
- Ethics in management and Indian Ethos, Biswanath Ghosh, Vikas
- Bob Tricker, Corporate Governance, Oxford.
- Corporate Governance and Social responsibility, Balachandran, Chandrasekharan, PHI
- Business Ethics -Concepts and Cases, Weiss, Cengage.
- Business Ethics, Himalaya, C.S.V. Murthy.
- Ethical Management, Satish Modh, Mcmillan.

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(17E00302) GREEN BUSINESS MANAGEMENT

Objective : The objective of the course is to impart students in understanding of green business, its advantages, issues and opportunities and to provide knowledge over the strategies for building eco-business .

1. Introduction to Green Management: The Concept of Green Management; Evolution; nature, scope, importance and types; Developing a theory; Green Management in India; Relevance in twenty first century

2. Organizational Environment; Indian Corporate Structure and Environment; How to go green; spreading the concept in organization; Environmental and sustainability issues for the production of high-tech components and materials, Life Cycle Analysis of materials, sustainable production and its role in corporate environmental responsibility (CER).

3. Approaches from Ecological Economics; Indicators of sustainability; Eco- system services and their sustainable use; Bio-diversity; Indian perspective; Alternate theories

4. Environmental Reporting and ISO 14001; Climate change business and ISO 14064; Green financing; Financial initiative by UNEP; Green energy management; Green product management

5. Green Techniques and Methods; Green tax incentives and rebates (to green projects and companies); Green project management in action; Business redesign; Eco-commerce models

Text Books:

- Green Management and Green Technologies: Exploring the Causal Relationship by Jazmin SeijasNogarida , ZEW Publications.
- The Green Energy Management Book by Leo A. Meyer, LAMA books

References:

- Green Marketing and Management: A global Perspective by John F. Whaik, Qbase Technologies.
- Green Project Management by Richard Maltzman And David Shiden, CRC Press Books.
- Green and World by Andrew S. Winston, Yale Press B

(17E00303) ENTREPRENEURSHIP DEVELOPMENT

Objective: The objective of the course is to make students understand the nature of entrepreneurship, and transform energy to students to take unexplored career paths .

1. **Nature and Forms of Entrepreneurship:** Features - Entrepreneur's competencies, attitude, qualities, functions. Entrepreneurial scenario in India and Abroad. Small Business, Importance in Indian Economy, Types of ownership, sole trading, partnership, Important features of various types of businesses - corporate entrepreneurship, intrapreneurship - Role of Government in the promotion of Entrepreneur.
2. **Institutions supporting business enterprises :** Central level institutions - NBMSME, KVIC, The coir board, NSIC, NSTEDB, NPC, EDI, NRDCI, National entrepreneurship Development Institutes. State level Institutions - State Directorate of Industries & Commerce, DIC, SFC, SIDC, SIADB. Other institutions : NABARD, HUDCO, TCO, SIDBI, Business incubators
3. **Project Planning and Feasibility Studies:** The Concept of Project, Project Life Cycle - Project Planning, Feasibility – Project proposal & report preparation.
4. **MSMEs & New Venture Creation:** Concept of MSME, Role & Importance of MSMEs, Growth & development of MSMEs in India, Current schemes for MSMEs, Business opportunities in India, Contents of business plans, presenting a business plan.
5. **Women & Rural Entrepreneurship and EDPs:** Scope-Challenges faced by women entrepreneurs, Institutions supporting women entrepreneurs. Successful cases of women entrepreneurs.-Need, Rural Industrialization – Role of NGO's – Organising EDPs – Need, Objectives, Evaluation of Entrepreneurship Development Programmes

Text Books :

- The Dynamics of Entrepreneurial Development and Management, Vasanth Desai, Himalaya.
- Entrepreneurship Development & Small Business Enterprises – Second Edition, Poornima M. Charantimath , Pearson

References:

- Entrepreneurial Development, S. Chand and Company Limited, S.S. Khanka, .
- Fundamentals of Entrepreneurship, H. Nandan, PHI.
- Entrepreneurship, 6/e, Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH.
- Entrepreneurship – New venture Creation, Holt, PHI.
- Entrepreneurship- Successfully Launching New Ventures, Barringer, Ireland, Pearson.
- Entrepreneurship, Roy, Oxford.

(17E00304) COST AND MANAGEMENT ACCOUNTING
(Elective I)

Objective: To describe the cost concepts, cost behaviors, and cost accounting techniques that are applied to manufacturing and service businesses. To provide an understanding of the use of cost information in support of different strategies

- 1. Nature and scope of accounting:** Cost analysis, concepts and classifications, Cost sheets, preparation of cost sheets, Tenders and Quotations.
- 2. Material Purchase control:** Levels, aspects, need and essentials of material control. Stores control-stores department, EOQ, Stores records, ABC analysis, VED analysis..
- 3. Labor cost:** Computation and control, Time keeping-Methods of wage payment-Time rate and piece rate system-Payroll procedures-Idle time and overtime-Labor turnover.
- 4. Management Accounting:** Meaning, scope, importance and limitations – Management Accounting Vs Cost Accounting - Management Accounting Vs Financial Accounting.
- 5. Analysis and Interpretation Of Financial Statements:** Nature, Objectives, Tools, Methods-Comparative Statements, Common size statements and Trend analysis

Text Book:

- A Text book of Cost and Management Accounting – Arora M. N, 11/e, Vikas

Reference Books:

- Cost Accounting :Theory and Practice - Bhabatosh Banerjee, 12/e, PHI.
- Financial Statement Analysis and Reporting - Mohana Rao P, PHI, 2011.
- Cost Management :A strategic Approach - Vaidya S. C, Suveera Gill Macmillan 2010.
- Cost Accounting- Jawaharlal, & Seema Srivastava, 4/e, TMH.
- Accounting & Costing for Management – Sinha P. K, Excel BOOKS, 2010.
- A Textbook of Cost Management- G.V Kesava Rao, D Gopinath, M.G. Krishnamurthy and Anita S. Yadav, Paramount Publishing House,

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(17E00305) PRODUCT AND BRAND MANAGEMENT
(Elective I)

Objective: The objective of the course is to provide students with detailed knowledge of Classification of Products, Product Mix, Product Line, Product Strategies, Product Positioning Strategies, Product Planning and Development for existing products, New Product Development, Brands in New economy – Brand Hierarchy, Brand Personality, Brand Image, Brand Identity,

- 1. Product Decisions :** - Product Concepts – Product Classification – Consumer Goods and Industrial Goods Classification – Product Line and Product Mix – Product Characteristics – Responsibility of Product Manager – Types of Product Strategies
- 2. Product Management :** Product differentiation – Product Strategies – Stages in the New Product Development – Product Positioning Strategies – Packaging Management
- 3. Branding Decisions :** Essentials of Good Brand Name – Types of Brands – Advantages of branding – Brand Loyalty – Brand Valuation Methods – Brand Revitalization
- 4. Creating and Managing Brand Equity :** Advantages of Brand Equity – Brand Building Strategies – Brand Extension – New Brand Failures -
- 5. Branding in Different Sectors:** Branding in Industrial sector, Retail Sector, Service sector, Banking Sector and Insurance Sector.

Text book :

- Marketing Management –Philip Kotler, Kevin Lane Keller ,15th Edition, Pearson.

REFERENCES:

- Product & Brand Management – Text & Cases, Prof.K.Venugopal Rao, Himalaya
- Product Management in India, Ramanuj Majumdar, PHI
- Product Management ,C.Nandan, , TMH.
- Compendium of Brand Management, Chunawalla. S.A, Himalaya
- Product & Brand Management, Mathur.U.C , Excel
- Brand Positioning, Subroto Sengupta, TMH.
- Marketing and Branding, S.Ramesh Kumar, Pearson.
- What's in a Brand? , John Philip Jones, TMH
- Brand Management – Text & Cases , Harsh V Verma , Excel
- Become the Brand of Choice, Jason Hartman, Jaico.

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(17E00306) HUMAN RESOURCE DEVELOPMENT
(Elective I)

Objective: The objective of the course is to provide an understanding of the human resources development framework and focuses on management best practices, tools and models to implement an effective HRD system

1.Introduction to Human Resource Development: Meaning, significance and objectives of Human Resource Development, Human Resource Management and Human Resource development functions, Human Resource Development challenges

2.HRD Need Assessment & Designing of HRD programs: Strategic/ Organizational Analysis- Task Analysis- Person Analysis- prioritizing HRD needs, defining the objectives of HRD Intervention - Selecting the trainer - Selecting the Training methods - Preparing training material Scheduling an HRD program

3.Implementation &Evaluation of HRD programs: Training methods - Classroom training Approaches - Computer based Training, Purpose of HRD Evaluation- Kirkpatrick's evaluation frame work - Data collection for HRD Evaluation - Assessing the impact of HRD programs in Monetary Terms

4.Career Management and Development: Introduction to Career management, meaning - Stages of life and Career Development - process of career Development - Issues in career development.

5.HRD & Diversity: Introduction - Organizational culture - Labor market changes and discrimination adapting to demographic changes

Text books:

- Jon M Werner,Randy L DeSimone : Human Resource development (Thomson/Cengage)
- Raymond A Noe : Employee Trainee Development (Tata McGraw Hill)

References:

- John P. Wilson Human Resource Development (Kogan Page Business Books)
- Tripathi P.C : Human Resource Development (Sultan Chand & Sons)
- Uday Kumar Haldar : Human Resource Development (Oxford)

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(17E00307) MOBILE COMMERCE
(Elective I)

Objective: The objective of the course is to describe M-commerce system concepts ,to critically analyze examples and cases of M-commerce systems and to examine some of the applications in M-commerce

1. Current Status and Future Trends in Mobile Commerce, Technology Issues in Mobile Commerce, Mobile Commerce Systems, Mobile Ecommerce on Mobile Phones, Technologically advanced handheld devices, like Smart phones, PDAs, Laptops, Tablets and Portable gaming consoles etc.
2. Transactional Database Accesses for M-Commerce Clients, Techniques to facilitate Information Exchange in Mobile Commerce, Information System and Application Issues in Mobile Commerce, The emergence of Location based Mobile Commerce, The need for Mobile based Approaches
3. Managing the Interactions Between Handheld Devices Mobile Applications and Users, Mobile Commerce and Usability, a Landscape Analysis,
4. Mobile marketing, mobile ticketing, mobile computing, mobile payments and mobile banking vis-a-vis latest technologies (wireless and mobile communication technology, digital cellular technology, mobile access technology and 4G and 5G systems
5. Configuring M-Commerce Portals for Business Success, Knowledge Management in a Mobile Computing Context, Multimedia Messaging Peer Mobile Financial Services, Mobile Banking – A Strategic Assessment, Service for Mobile Commerce Applications, Quality of Perception in M Commerce

Text Book:

- Advances in Mobile Commerce Technologies, EE-Peng Lim, KengSiau, Idea Group of Publishing

Reference Books:

- Mobile Commerce Applications, Shi, Nansi, Idea Group of Publishing
- Mobile Commerce, KarabiBandyopadhyay, PHI

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(17E00308) FINANCIAL INSTITUTIONS AND SERVICES
(Elective II)

Objective: The objective of the course is to provide to students an understanding of Financial Markets, the major institutions involved and the services offered within this framework.

1. **Introduction:** The structure of financial system, Elements of financial system and economic development, Regulatory and Promotional Institutions - Function and Role of RBI, Monetary Policy and techniques of RBI,
2. **The Banking and Non-banking Institutions:** The public and the private sectors – structure and comparative performance, Bank capital and Banking Innovations, Commercial and Co-operative banks. The Non-banking financial Institutions - Mutual Funds, Growth of Indian Mutual funds and its Regulation. The Role of AMFI, Insurance Companies- Role of IRDA.
3. **Financial and securities Markets:** Primary and Secondary Markets, Structure and functions of Money Market, -Call call money market, Government Securities Market – T-bills market, Commercial Bills market, Commercial paper and certificate of deposits. Securities markets:- Organization and structure, listing trading and settlement of securities market, The role and functions of SEBI
4. **Fund based services** - Lease and hire purchase consumer credit and Factoring - Definition, Functions, Advantages, Evaluation, venture capital financing, Housing Finance.
5. **Fee-based services** - Stock broking, credit rating, Merchant Banking, portfolio services. Underwriting, Depository services, Challenges faced by investment bankers.

Text Books:

- Financial Institutions and Markets, L. M. Bhole, 4/e Tata McGraw Hill.
- Financial services, Gordon & Natarajan, Himalaya publishers.

References:

- Financial Services and markets, Dr. Punithavathy Pandian, Vikas
- Financial Markets and services, Appannaiah, Reddy and Sharma, HPH
- Indian Financial System, Ramachandra and others, HPH
- Investment Institutions and Markets, Jeff Madura, Cengage, 1st Edition.
- Financial services, Thirupati, PHI.
- Financial Markets & Services, Vasanthdesai, Himalaya.
- Financial Institutions and Markets, Gupta Agarwal, Kalyani publishers.
- Management of Financial Services, C. Rama Gopal, Vikas.

(17E00309) CONSUMER BEHAVIOR
(Elective II)

Objective : The objective of the above course is to enable students to understand the perspectives of consumers and their buying behavior. The pre-requisite for the course is Marketing Management .

1. **Introduction to consumer behavior:** Understanding consumers and market segments. Consumer behavior and marketing strategy, Psychographic Dimensions- consumer motivation, Perception, personality, Information processing, Attitude formation and attitude change.
2. **Social and Cultural Environment :** Economic, Demographic, Cross Cultural and socio-cultural influences, Social Stratification, Reference Groups and family influences, personal influence.
3. **Communication and consumer behavior:** Process, designing persuasive communication and diffusion of Innovations. Models of Buyer behavior- Howard – Sheth Model, EKB Model, Webster and Wind Model.
4. **Consumer decision process :** High and Low Involvement, Pre-purchase processes, Purchase ,post purchase process, Consumption and Evaluation, Brand Loyalty and Repeat Purchase Behavior.
5. **Consumerism:** The roots of consumerism, consumer safety, consumer information, environmental concerns, consumer privacy, legislative responses to consumerism, and marketer responses to consumer issues. Consumer protection Act 1986, Consumer disputes Redressal agencies and Commission.

Text Book:

- Schiff man , L.G and Kanuk L.L : Consumer Behavior, 8/e ,Pearson,2009

References :

- Ramesh Kumar : Consumer Behaviour (pearson Education)
- LeonG.Scistman& Leslie Leaserkarmal :Consumer Behaviour, PHI
- SujaR.Nair : Consumer Behaviour in Indian Perspective, Himalaya
- Subash Mehta : Consumer Behaviour, Tata McGraw Hill
- RajjevKumra : Consumer Behaviour, Himalaya Publications

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(17E00310) Labor Laws and Legislations
(Elective II)

Objective : In this era of Industrialization it is very significant to understand basics of management. This programme enables the candidate to capture the significant elements of laws to run an industry. It is a course which should be done by candidates who want to understand management fundamentals and basic elements of an Industry

- 1. Legal frame work: evolution of labour laws in India** – labour legislations – meaning, importance and relevance to HRM
- 2. Legislations relating to employment and working conditions:** Industrial employment (standing orders) Act, 1946 – Factories Act 1948 - contract labour (Regulation and abolition) Act 1970
- 3. Laws relating to remuneration:** Payment of wages Act, 1936, Minimum wages Act, 1948 – Payment of Bonus Act, 1965
- 4. Laws relating to industrial Relations :** Industrial Disputes Act ,1947 - preventive and settlement machinery – trade unions Act, 1926 – workers participation in management
- 5. Laws relating to social security :** Work men's compensation Act, 1923 – ESI Act, 1948- Employees provident fund and miscellaneous provisions Act, 1952 - Maternity benefits Act, - 1961 Payment of gratuity Act, 1972

Text Books:

- Industrial Relations and labour laws -Tripathi. P.C- Sultan chand and sons
- Mercantile law – N.D. Kapoor - Sultan chand and sons

Reference books:

- Industrial Relations and labour laws - Sri Vastva – vikas publishers
- Industrial Relations and laws in India – Agarwal LL
- Industrial Relations and labour laws - Sinha & sinha, Oxford IBH
- Legal aspects of business – Pillai.RSN&Bhagavathi (2011), Sultan chand and sons
- Industrial Law- P.L.Malik, eastern book company

(17E00311) SUPPLY CHAIN MANAGEMENT
(Elective II)

Objective: The Objective of this course is to gain the knowledge of possibilities of efficient optimization and management of operation in integrated supply chains and also the ability to apply them in the enterprise reality. The course will also strengthen the holistic view on supply chain operations, management and strategy and some current research areas in supply chain management.

- 1. Role of Distribution in Value discovery:** Designing a distribution logistics system – Outsourcing of distribution logistics – Distinction between distribution logistics and supply chain management. Introduction -Supply Chain – Fundamentals –Evolution- Role in Economy -Importance - Decision Phases - Supplier- Manufacturer-Customer chain. - Enablers/Drivers of Supply Chain Performance.
- 2. Strategic Sourcing :** Outsourcing – Make Vs buy - Identifying core processes - Market Vs Hierarchy - Make Vs buy continuum -Sourcing strategy - Supplier Selection and Contract Negotiation. Creating a world class supply base- Supplier Development - World Wide Sourcing.
- 3. Supply Chain Network** - Distribution Network Design – Role – Factors Influencing Options, Value Addition – Distribution Strategies - Models for Facility Location and Capacity allocation. Distribution Center Location Models. Supply Chain Network optimization models. Impact of uncertainty on Network Design – Network Design decisions using Decision trees.
- 4. Planning Demand, Inventory And Supply** - Managing supply chain cycle inventory. Uncertainty in the supply chain – Analysing impact of supply chain redesign on the inventory - Risk Pooling - Managing inventory for short life – cycle products - multiple item -multiple location inventory management. Pricing and Revenue Management
- 5. Current Trends** - Supply Chain Integration - Building partnership and trust in SC Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain. . SC Restructuring - SC Mapping -SC process restructuring, Postpone the point of differentiation.

Text Books :

- D K Agrawal, Textbook of Logistics and Supply Chain Management, MacMillan 2003, 1st Edition.
- G Raghuram & N Rangaraj, Logistics and Supply Chain Management - Cases and Concepts. Mac Millan.

References:

- Supply chain Logistics Management, Bowersox, Closs, Cooper, 2/e, TMH.
- Supply chain management concepts and cases, Rhaul V. Altekhar, PHI.
- Principles of Supply Chain Management – A balanced approach, Wisner, Leong, Tan, Cengage.
- Exploring Supply Chain – theory and practice, Upendra Kachru, excel.
- Supply Chain Management, R.P. Mohanty and S.G. Deshmukh, Jaico .

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(17E00312) INVESTMENT AND PORTFOLIO MANAGEMENT
(Elective III)

Objective: The objective of the course is to provide students an understanding of working of capital markets and management of portfolios of stocks. The pre-requisite for the course is Financial Accounting and Analysis and Financial Management.

*** Standard discounting and statistical tables to be allowed in the examinations.**

1. **Investment:** Introduction to stock markets -objectives, Process of Investment, Investment and speculation.
2. **Fundamental Analysis & Technical Analysis:** Framework of Fundamental analysis- Economic analysis, Industry analysis-Industry Life cycle - Company analysis, Fundamental Analysis Vs Technical Analysis - Dow Theory.
3. **Measurement of Risk and Return:** Revenue Return and Capital appreciation, holding period –Calculation of expected return, Risk factors, risk classification – systematic risk – unsystematic risk – standard deviation – variance– Beta .
4. **Valuation of Securities:** Types of Securities - Approaches of valuation – Bond valuation – Preference share Valuation – Common stock Valuation.
5. **Portfolio Management:** Process of Portfolio Management, Modern Portfolio – Portfolio models – Markowitz model – Sharpe single index model, Capital Asset Pricing Models.

Text Books:

- Investment Management, V.K.Balla, S.Chand Company Ltd
- Security Analysis and Portfolio Management, Punithavathy Pandian, Vikas

References:

- Investment Analysis and portfolio management, Chandra, Tata McGraw Hill .
- Security Analysis Portfolio Management, Ranganatham&Madhumathi, Pearson Education.
- Security Analysis and Portfolio Management, Sudhindra Bhat, excel.
- Security analysis and portfolio management, Avadani, Himalaya publishers.
- Investment analysis portfolio management, Frank Reilly & Brown, Cengage.
- Investment Management, Preethi Singh, Himalaya Publishing House, Mumbai..
- Investment, Bodie, McGraw Hill Book Company.
- Investment Management, Hiriappa, New Age Publications

(17E00313) Rural Marketing
(Elective III)

Objective : The objective of the course is to give an understanding about the structure of Rural markets in India & Government role in promoting Rural Marketing.

- 1. Introduction to Rural marketing:** Meaning, scope, definition & importance, Rural versus Urban mindsets, Growth of rural markets, Basic differences between rural, semi urban and urban markets. Classification of Rural Consumer based on economic status, profile of rural consumer, rural consumer behavior.
- 2. Rural Marketing strategies:** Product strategies, pricing strategies, distribution strategies, production strategies, Methods of sale, Hatha system, Private Negotiations, Quotations on samples, Dara Moghum sale Methods, Open Auction Method. Prevalence of Beoparis and Arahatis Rural Mandi's, APMC's etc.
- 3. Role of Government in the development of Agricultural Marketing :** Government intervention in Marketing system, Role of agencies like , Council of State Agricultural Marketing Boards, (COSAMB), State trading, Cooperative Marketing, Types of Cooperative marketing societies, Cooperative Processing, National Agricultural Cooperative marketing federation (NAFED), National Cooperative Development Corporation (NCDC), Public Distribution Systems (PDS), Food Corporation of India, Directors of Marketing and Inspection (DMI), National institute of Agricultural Marketing (NIAM), Self help Groups (SHG's)
- 4. Agricultural Credit and Crop Insurance:** Agricultural Credit Policy, Institutional Agreements for Agricultural Credit, Crop Insurance, Agricultural Insurance.
- 5. Role of IT in Rural Marketing:** Infrastructure, Importance & scope, Modern techniques for rural distribution, Case study of ITC's " e-choupal" Initiative

References:

- Rural Marketing : Environment, Problems and strategies –T.P.Gopalaswamy, Vikas Publishing house.
- Rural Marketing in India – K.S.HabebRahman ,Himalaya Publishers.
- Rural Marketing in India – R.V.Bedi , Himalaya Publishers
- Rural Marketing- Focus on agricultural inputs, Sukhpalsingh ,Vikas Publishing house.
- Integrated rural development – R.C.Arora , S.Chand& company

(17E00314) PERFORMANCE MANAGEMENT
(Elective III)

Objective : The objective of the course is to provide an outline of performance management of individuals in the organization. The prerequisite for the course is knowledge of HRM.

1. **Introduction to Performance management :** Concept -Performance management vs. performance appraisal--Performance management vs. Human resource management- Purposes- Significance .
2. **Mentoring and Monitoring:** Concept of mentoring - Benefits of mentoring - Characteristics of mentor- Mentoring process-Group mentoring -Benefits -Types of Group Mentoring – Pitfalls Monitoring performance.
3. **Coaching and counseling :** Coaching for performance improvement -. Concept - Tips for effective coaching Counseling -Functions of counseling- Steps in counseling process
4. **Annual Stock taking:** Stock taking of performance -Uses –Appraisal system design : Process and approaches - Appraisal methods - MBO and Assessment centre -360 degree appraisal - Balanced score card. Stock taking of potential- Appraisal for reward - Appraisal for recognition
5. **Learning organisation :** Concept of learning organisation- Learning approaches- Learning sources - Importance of learning-. Characteristics of learning organisation- Reward and compensation Management -Concept and types of compensation- Objectives - Competitive compensation design - Fringe benefits- Objectives - Factors influencing fringe benefits - Types of fringe benefits

Text books:

- Performance Management, A.S.Kohli, T.Deb,Oxford.
- Prem Chadha, Performance Management, McMillan.

References:

- Performance Management, Bagchi, Cengage Learnings.
- Performance Appraisal and Management, Sharma, Davinder, HPH
- Performance Management, Herman,Aguinis, Pearson Education.
- Performance Management and Appraisal Systems, T.V.Rao, Response.
- Performance management, Kandula, PHI.
- 360 Degree Feedback and Assessment and Development Centres, T.V.Rao, Excel.
- Performance Management, Dinesh k.Srivatsava, Excel

(17E00315) ENTERPRISE RESOURCE PLANNING
(Elective III)

Objective : The objective of the course is to provide the basic concepts of Enterprise Resource Planning, ERP Implementation and Maintenance.

1. **Introduction to ERP:** Overview of ERP,MRPI,MRPII and Evolution of ERP, Business Modeling, ERP related technologies,Business PROCESS Re-engineering (BPR) – BPR Process, Myths regarding BPR, ERP Architecture.
2. **Business Intelligence Systems**-Data Mining, Data Warehousing, On-line Analytical Processing (OLAP), On-line Transaction Processing (OLTP)
3. **ERP Modules :**Finance Controlling, Accounting System, Manufacturing and Production Systems.Sales and Distribution Systems, Human Resource Systems.Plant Maintenance System, Material Management System, Quality Management System,.
4. **ERP Implementation:** ERP Implementation life cycle, ERP package selection, ERP Implementation process, ERP project teams, ERP operation and Maintenance
5. **ERP Products:** SAP, Oracle, Microsoft Dynamic, People Soft, Baan and their impact on enterprise applications.

Text Books:

- Enterprise Resource Planning, Singla, Cengage Learnings.
- Enterprise Resource Planning,Mahadeo Jaiswal & Ganesh Vanapalli,Macmillan

References:

- Enterprise Resource Planning, Alexis Leon, TMH.
- Enterprise Resource Systems,Motiwalla,Pearson.
- ERP in practice, Jagan Nathan Vaman, TataMc.GrawHill.
- Enterprise Resource Planning and MIS,Venugopal Rao, Excel.
- ERP concepts &Practice,Vinod Kumar Kard arid NK Venkata Kristean, PHI.
- Concepts in ERP ,Monk,2/e Thomson.
- Managerial Issues of ERP, David L.Olson , TMH

(17E00316) AUDITING AND TAXATION

(Elective IV)

Objective : To make the students familiar with the basic concepts of Income Tax and computation of income and audit aspects of business accounts.

1. Introduction to Auditing : Definition, objective of Audit, Advantages and limitation of audit, Types of Audit - Basic Principles of governing audit. Vouching - Meaning and significance.

2. Company Audit : Meaning and significance of Company Audit - Audit programme- Audit note book - working papers- Commencement of new audit.

3. Verifications and valuation of Assets & liabilities: Qualifications, disqualifications appointment and removal of company auditor. Duties and rights of a company auditor - Preparation of an audit report.

4. Direct and Indirect Taxes : Features and History of Income Tax in India – Definitions and Basic Concepts of Income Tax: Assessee- Assessment Year – Previous Year – Person – Residential Status : Meaning of Residential Status – Conditions applicable to an Individual Assessee – Problems on computation of Total Income of an Individual based on Residential Status.

5. Introduction to GST Act : Meaning and definition of GST -Objectives of GST- Regulatory framework of GST-Scope of GST- Key features and Benefits of GST- GST rates in India

Text book:

- A Hand book on Practical Auditing- B.N. Tondan, S Chand Publishers

References:

- Income Tax Law and Practice: V.P. Gaur & D.B Narang, Kalyani Publishers
- Income Tax: B.B. Lal, Pearson Education
- Taxation: R.G. Saha, Himalaya Publishing House Pvt. Ltd.
- Taxation Law and Practice: Balachandran & Thothadri, PHI Learning

(17E00317) ADVERTISING AND SALES PROMOTION MANAGEMENT
(Elective IV)

Objective : The objective of the course is to provide students with detailed knowledge of some of the marketing mixes such as Sales and Promotion.

- 1. Advertising:** Meaning, Role of advertising, types of advertisement, industrial, institutional, retail, trade and professional, marketing mix, Advertising department and advertisement manager .
- 2. Organizing for Advertising:** Objectives and functions - Role and functions of advertisement agencies. Advertising agency and services, client agency relationship. Visual layout, art work, production traffic copy, effective use of words, devices to get greater readership interrelation.
- 3. Advertisement budgets and effectiveness:** Types, optimal expenditure, decision models, sales response and decay, competitive share, Pre-testing, post testing, experimental designs.
- 4. Sales Promotion:** Importance and scope; Need and objectives of sales promotion; Consumer promotion; channel promotion; Timing of sales promotion; Measurement of impact of sales promotion; sales promotion budgeting.
- 5. Publicity and public relations:** Scope and importance. Methods of publicity, Power of Publicity, advantages and disadvantages of Publicity, Process of Public relations-Marketing public relations functions; Public relations officer- role and functions.

Text Books :

- Advertising & Promotion : George E. Belch, THM
- Advertising and Promotion- An Integrated Marketing Communication approach, Shimp, Cengage

References:

- Integrated Advertising, Promotion and Marketing Communications, Clow, Baack, Pearson.
- Integrated Advertising, Promotion and Marketing Communications, Kruti Shah, Alon D'Souza, TMH.
- Advertising & Sales Promotion, SHH Kazmi, Satish Batra, Excel.
- Advertising Management with integrated Brand Promotion, O'Guinn, Allen, Semenik, Cengage.
- Advertising Management, Jethwaney, Jain, Oxford.
- Contemporary Advertising, Arens, TMH.
- Advertising, Sales and Promotion Management, S.A. Chunawalla, Himalaya.
- Sengupta, Subroto: Brand Positioning, Strategies for Competitive Advantages, Tata McGraw Hill

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(17E00318) KNOWLEDGE MANAGEMENT
(Elective IV)

Objective : The objective of the course is to provide the basics of the emerging area of Knowledge Management to students. This course focuses on few important concepts as Knowledge management and Information Technology, Knowledge process, etc.

1. **Introduction to KM:** Definition, scope and significance of Knowledge Management, Principles of Knowledge Management, Techniques of Knowledge Management, Data-Information-knowledge-Wisdom relationship
2. **Essentials of Knowledge Management:** Basic types of Knowledge management, Organisational Knowledge Management - Organisational knowledge types- Knowledge Life cycle- Organisational knowledge sources- process, Knowledge Conversion
3. **Implementation of Knowledge Management:** Discussion on Roadblocks to success, 10-step KM Road Map of Amrit Tiwana, Information Architecture: A three-way Balancing Act of KM .
4. **Knowledge Management and Information Technology:** Role Information Technology in Knowledge Management Systems, E-commerce and Knowledge Management, Bench marking and Knowledge Management
5. **Future of Knowledge Management and Industry perspective:** Knowledge Management in Manufacturing and service industry, future of Knowledge Management.

Text books:

- Knowledge Management, [Sudhir Warier](#): Vikas Publishing House.
- Web Warehousing & Knowledge Management, Mattison: Tata McGraw-Hill.

References:

- Knowledge management: An Evolutionary view, Becerra Fernandez: PHI.
- Knowledge Management, Fernando: Pearson.
- Knowledge Management, B.Rathan Reddy: Himalaya.
- Knowledge Management, Tapan K Panda: Excel.
- Knowledge Management systems, Barnes: Cengage.
- The Knowledge Management tool kit, Tiwana: 2/e, Pearson Education.
- Knowledge Management, Sislop: Oxford University Press,.
- Knowledge Management, Debowski: Wiley Student Edition, Wiley Ind
- Knowledge management, A Thothathri Raman, Excel books

(17E00319) DATA WAREHOUSING AND MINING
(Elective IV)

Objective: The objective of the course is to give an understanding Data Warehousing and Data Mining concepts.

1. Managing Data: Individual Data Management, Organisational Data Warehousing and Data Management, Components of Organisational Memory, Evaluation of Database Technology.

2. Database Systems in the Organisation: Data Sharing and Data Bases – Sharing Data Between Functional Units, Sharing Data Between Different Levels of Users, Sharing Data Between Different Locations.

3. The Data Warehouse Data Base: Context of Data Warehouse Data Base, Data Base Structures – Organizing Relational Data warehouse – Multi-Dimensional Data Structures – Choosing a Structure. Meta Data: Human Meta Data, Computer Based Meta Data for people to use, Computer based Meta Data for the Computer to use.

4. Analyzing the Contexts of the Data warehouse: Active Analysis, User Queries – OLAP Constructing a Data warehouse System: Stages of the Project – Developing a Project Plan, Data warehousing Design Approaches – The Architecture Stage.

5. Getting Data into the Data warehouse – Extraction, Transformation, Cleaning, Loading and Summarization. Data Mining, Creating a Decision Tree, Correlation and Other Statistical Analysis, Neural Networks, Nearest Neighbor Approaches, Putting the Results to Use.

Text Books :

- Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, 2nd Edition, 2006.
- Data Mining Introductory and advanced topics –Margaret H Dunham, Pearson education

References:

- Decision Support Systems and Data warehouse Systems, Efram G. Mallach: TMH.
- Data Mining Techniques and Tasks, T.H.M.Sivanandam, Thomson.
- Data Management, Data Bases and Organizations, Richard T Watson : Wiley.
- Modern Data Warehousing, Mining and Visualization Core Concepts, Marakas, Pearson
- Data warehousing, Data Mining OLAP, Berson Smith, TMH

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(17E00320)BUSINESS SIMULATION LAB

Objective : The course aims is to practice statistical tools in computer with MS-Excel and SPSS

.Learning Outcome: The learning outcome is that the students should be able to: Analyse the data to draw inference for decision making. Understand application of statistical measures of central tendency. Understand application of ANOVA. Analyse trends. Test hypotheses.

1. EXCEL Lessons:- Customizing the Quick Access Toolbar.- Creating and Using Templates.-Working with Data: Entering, Editing, Copy, Cut, Paste, Paste Special.- Formatting Data and Using the Right Mouse Click.- Saving, Page Setup, and Printing.- Using Headers and Footers.- Manipulating Data, using Data Names and Ranges, Filters and Sort and Validation Lists.- Data from External Sources.- Using and Formatting Tables.- Basic Formulas and Use of Functions.-Data Analysis Using Charts and Graphs.-Managing, Inserting, and Copying Worksheets.- Securing the Excel Document (Protect Cells and Workbook).

2. Advanced excel lessons- Advanced Formulas and Functions.-Advanced Worksheet Features.-Advanced Data Analysis using PivotTables and Pivot Charts.

3. Overview of SPSS, Uses, Data Analysis. Making students/Learn Familiar with Main menu and other features of SPSS Package

4. Simulation of frequency distributions:- Binomial, poisson, exponential, weibull and Normal Distributions

5. Statistical tools for execution using excel:- Tabulation, bar diagram, Multiple Bar diagram, Pie diagram, Measure of central tendency-mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of-variation. Correlation, regression lines.

t- test, F-test, ANOVA one way classification, chi square test, independence of attributes.

Text Book

- Glyn Davis & Branko Pecar “Business Statistics Using Excel” Oxford University Press.

References

- David Whigham “Business Data Analysis Using Excel” Oxford University Press.
- Winston “Excel 2010 Data Analysis and Business Modelling” PHI Learning Private Limited.
- Bajpai “Business Statistics” Pearson.
- D P Apte : Statistical Tools for Managers USING MS EXCEL, Excel Books.
- David M Levine, David. F. Stephan & Kathryn A. Szabat, Statistics for Managers – Using MS
- Bruce Bowerman, Business Statistics in Practice, TMH.
- Shelly, MS Office, 2007, Cengage.

(17E00401) STRATEGIC MANAGEMENT

Objective : The Objective of the course is to enable students have a grasp of various business strategies in general and functional management areas. It will provide a strategic orientation in conduct of the business

1. **Introduction- Concepts in Strategic Management**, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Environmental Scanning -Concepts of Core Competence, Crafting a strategy for competitive advantage.
2. **Strategic Analysis and Choice: Tools and techniques-** Porter's Five Force Model, BCG Matrix, GE Model, SWOT Analysis and TOWS Matrix,. Market Life Cycle Model - and Organisational Learning, and the Experience Curve.
3. **Strategy Formulation** : Formulation of strategy at corporate, business and functional levels. Strategy Alternatives:- Stability Strategy, Growth Strategy, Retrenchment Strategy, and Combination Strategy, .
4. **Strategy Implementation** : Types of Strategies : Offensive strategy, Defensive strategy, vertical integration, horizontal strategy; Tailoring strategy to fit specific industry and company situations, Strategy and Leadership, Resource Allocation as a vital part of strategy – Planning systems for implementation.
5. **Strategy Evaluation and control** – Establishing strategic controls - Role of the strategist - benchmarking to evaluate performance - strategic information systems – Guidelines for proper control- Strategic surveillance -strategic audit - Strategy and Corporate Evaluation and feedback in the Indian and international context.

Text Book :

- Strategic Management – J.S.Chandan& Nitish sen Gupta, Vikas

References:

- Strategic Management Concepts and Cases ,FredR.David, PHI.
- Strategic Management,Hill, Ireland, manikutty, Cengage.
- Concepts in Strategic Management and Business Policy,Wheelen& Hunger, Pearson Education.
- Strategic Management – Text and Cases, V.S.P. Rao, Excel.
- Strategic Management, Ireland, Hoskinsson, Hitt, Cengage.
- Strategic Management – Theory and Application, Habergerg, Rieple, oxford .
- Strategic Management, P. SubbaRao, Himalaya.
- Business policy and strategic management, SukulLomash, P.K.Mishra, Vikas

(17E00402) E-BUSINESS

Objective : The course imparts undertaking of the concepts and various application issues of e-business like Internet infrastructure, security over internet, payment systems and various online strategies for e-business.

1. **Introduction to e-business :** Electronic business, Electronic commerce, difference between e-business & e-commerce, electronic commerce models, types of electronic commerce, value chains in electronic commerce, E-commerce in India, internet, web based tools for electronic commerce. Electronic data, Interchange, components of electronic data interchange, electronic data interchange process.
2. **Security threats to e-business:** Security overview, Electronic commerce threats, Encryption, Cryptography, public key and private key Cryptography digital signatures, digital certificates, security protocols over public networks : HTTP, SSL, Firewall as security control, public key infrastructure (PKI) For Security.
3. **Electronic payment system :** Concept of money, electronic payment systems, types of electronic payment systems, smart cards and electronic payment systems, infrastructure issues in EPS, Electronic fund transfer.
4. **E-business applications and strategies :** Business models & revenue models over internet, emerging trends in e-business- governance, digital commerce, mobile commerce, strategies for business over web, internet based business models.
5. **E-business infrastructure and e-marketing :** Hardware system software infrastructure, ISP's, managing e-business applications infrastructure, what is e-marketing, e-marketing planning, tactics, strategies.

Text books:

- Dave Chaffey : e-business & e-commerce management- Pearson.
- e-commerce- e-business : Dr. C.S. Rayudu, Himalaya.

References :

- Whitley, David (2000) , e-commerce strategy, Technologies and applications. TMH.
- Schneider Gary P. and Perry, James T (1ST edition 2000) Electronic commerce, Thomson Learning.
- Bajaj, Kamlesh K and Nag, Debjani (1st edition 1999) , e-commerce, The cutting edge of business, TMH Publishing company

(17E00403) FINANCIAL DERIVATIVES
(Elective V)

Objective: The objective of this course is to make students efficient in the area of Financial Derivatives, giving them the knowledge of basics in Financial Derivatives, Future Markets, Option Strategies, etc.

*** Standard discounting and statistical tables to be allowed in the examinations.**

1. **Introduction to Derivatives:** Development and Growth of Derivative Markets, Types of Derivatives, Uses of Derivatives, Financial and Derivative markets -Fundamental linkages between spot & Derivative Markets, The Role of Derivatives Market in India.
2. **Future and Forward Market:** structure of forward and Future Markets, Mechanics of future markets, Hedging Strategies, Using futures. Determination of forward and future prices - Interest rate futures, Currency futures and Forwards
3. **Options:** Distinguish between Options and Futures, Structure of Options Market, Principles of Option Pricing, Option Pricing Models: The Binomial Model, The Black Scholes Merton Model.
4. **Basic Option Strategies:** Advanced Option Strategies, Trading with Options, Hedging with Options, Currency Options.
5. **Swaps:** Concept and Nature of Swaps—Major Types of Financial Swaps –Interest Rate Swaps –Currency Swaps –Commodity Swaps – Credit Risk in Swaps

Text Books:

- Financial Derivatives, Gupta, 1st Edition, PHI.
- Fundamentals of futures and options market, John C Hull: Pearson Education.

References:

- Financial Derivatives and Risk Management, OP Agarwal, HPH
- Commodities and Financial Derivatives, Kevin, PHI
- Fundamentals of Financial Derivatives, Swain.P.K, HPH
- Financial Derivatives, Mishra: Excel.
- Risk Management & Derivatives, Stulz, Cengage.
- Derivatives and Risk Management, Jayanth Rama Varma: TMH.
- Risk Management Insurance and Derivatives, G. Koteswarar: Himalaya

(17E00404) SERVICES MARKETING
(Elective V)

Objective : The objective of the course is to provide a deeper insight into the marketing management of companies offering services as product.

1: Understanding services marketing: Introduction, Characteristics of services marketing mix, services in the modern economy, Classification of services, marketing services Vs. Physical services.

2: Customer Expectations of service: Service expectations, types of expectations, factors that influence customer expectations of service. Issues in involving customers service expectations, Customer defined service standards.

3. Pricing & Promotion strategies for services: Service pricing, establishing monetary pricing objectives, foundations of pricing, pricing and demand, putting service pricing strategies into practice.

4. Service promotion: The role of marketing communication. Implication for communication strategies,, marketing communication mix.

5. Marketing plans for services: The marketing planning process, strategic context, situation review marketing strategy formulation, resource allocations and monitory marketing planning and services.

Text Books:

- Services Marketing – Text and Cases, Rajendra Nargundkar, TMH.
- Services Marketing—Integrating Customer Focus Across the Firm, Valarie A. Zeithaml & Mary Jo Bitner: TMH.

References:

- Services Marketing People, Technology, Strategy, Christopher Lovelock, Wirtz, Chatterjee, Pearson.
- Services Marketing – Concepts planning and implementation, Bhattacharjee, excel, 2009
- Services Marketing, Srinivasan, PHI.
- Services – Marketing, Operations and Management, Jauhari, Dutta, Oxford.
- Marketing of Services, Hoffman, Bateson, Cengage.
- Service sector Management, C. Bhattacharjee, Jaico.

(17E00405) ORGANIZATION DEVELOPMENT
(Elective V)

Objective : The objective of the course is to provide the students with the conceptual framework and the theories underlying Organizational Development.

- 1. Organization Development** –Definition – Characteristics - Contributory Stems, Values, Assumptions, Beliefs in OD - Ethical issues in OD.
- 2. Foundations of OD-** Systems Outlook- Third Wave Management and Organization Transformation.
- 3. Diagnostic Process and Areas of Diagnosis** –Action Research- As a Process and Approach- OD
- 4. Interventions classification** – Team Interventions – Intergroup Interventions- Third party peace making intervention, Structural Interventions- Comprehensive Interventions and Training Experience, Other Interventions- T- Groups, Behaviour Modelling, Life and Career Planning.
- 5. Consultant Issues** – System Ramifications – Power politics in OD – Future of OD.

Text Books:

- Organisation Development and Transformation, French, Bell &Zawacki, TMH.
- Organization Development,French&Bell,Pearson

References:

- Organisation Change and Development,Kavita Singh: Excel.
- Organization Development,Daniel Robey & Steven Actman,Macmillan.
- OrganisationDevelopmentChange,Cummins&Worley,Thomson/Cengage.
- Organisation Development Interventions&Strategics, S. Ramnarayan, T.v Rao &kuldeepsingh,Response.

(17E00406) DATA COMMUNICATION AND NETWORK ANALYSIS
(Elective V)

Objective : The objective of the course is to provide the basic concepts of Data Communication and Network Analysis, network security, privacy and data encryption.

- 1. Introduction** – General structure of Networks – ISO, OSI Reference Model. Hierarchical Network, connectivity analysis – delay analysis – local access Network design. Physical layer: transmission and multiplexing – digital transmission – circuit switching packet switching – terminal handling – error correction and error correcting codes.
- 2. Data – link layer:** simple protocols. Unrestricted stop and wait sliding window protocols. Network layer: virtual circuits and data grams, centralize hierarchical and broadcasting algorithms.
- 3. Transportation layer and Session layer:** transport service – addressing and connection establishment – flow control and buffering – synchronization – crash recovery gate way– internet work fragmentation – session layer.
- 4. Presentation layer:** network security and privacy – data encryption – key distribution authentication and digital signatures – virtual terminal protocols – file transfer protocols.
- 5. Application layer** – distribution systems ISDN – Service & History, TCP/IP and Net Working and Internet working Derives.

Text Books :

- Understanding Data Communications & Networks, William A. Shay, Vikas.
- Data Communications and Net Working, Behrouz A. Forouzan, TMH

References:

- Data Communication and Computer Networks, Duck& Read, Person.
- Data Networks, Bertsekas&Gallages, PHI
- Computer Communications and Networking Technologies, Michael A. Gallo, Cengage.

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(17E00407) INTERNATIONAL FINANCIAL MANAGEMENT
(Elective VI)

Objective: The objective of the course is to provide students with a broad view of International Monetary Systems and its understanding to enable a global manager to do business in a global setting. The prerequisite for the course is Financial Accounting and Analysis and Financial Management.

1. **Introduction to International Financial management:** IFM meaning, Difference between FM & IFM, Nature ,Scope, Importance.
2. **Foreign Exchange Market:** Functions and Structure of the Forex markets, major participants, types of transactions and settlements, Foreign exchange quotations, .
3. **Management of foreign exchange exposure and risk:** Types of Exposure, Economic Exposure, Transaction Exposure, Operating Exposure.
4. **Cross-border Investment Decisions:** Capital budgeting, Approaches to Project Evaluation, Risk in Cross-border Investment Decisions.
5. **Financing Decisions of MNC`s & Working Capital Management:** Introduction, the cost of capital, capital structure, Cash management, management of receivables, Inventory management.

Text Books:

- International Financial Management, V.K.Bhalla ,S.Chand
- International Financial Managemen, EphriamClark , Cengage.

References:

- International Finance , Prakash .G.Apte, TMH
- International Financial Management, T.Siddaiah: Pearson.
- International Financial Management ,M.K.Rastogi
- International Financial Management, S.EunChoel and Risnick Bruce: TMH.
- International Financial Management, Machi Raju, HPH.
- international finance management, Jeff Madura, Cengage.
- International Financial Management, Sharan5th Edition, PHI.
- International Financial Management, MadhuVij: Excel, .
- International Financial Management, V. A Avadhani, Himalaya .

(17E00408) INTERNATIONAL MARKETING
(Elective VI)

Objective : The objective of the course is to provide students with a perspective of International Marketing Management, its environment and complexities.

- 1. International Marketing:** Scope and Significance of International Marketing, The importance of international marketing, Differences between international and domestic marketing, legal environment and regulatory environment of international marketing.
- 2. International Market Entry Strategies:** Indirect Exporting, , Direct Exporting, Foreign Manufacturing Strategies with Direct Investment. Entry Strategies of Indian Firms.
- 3. International product management:** International product positioning, Product saturation Levels in global Market, New products in International Market, Products and culture, brands in International Market.
- 4. International Marketing Channels:** Distribution Structures, Distribution Patterns, Factors effecting Choice of Channels, the Challenges in Managing an international Distribution Strategy, Selecting Foreign Country Market intermediaries. The management of physical distribution of goods, Grey Market goods.
- 5. Export Marketing:** Introduction to Export Marketing, Export Policy Decisions of a firm, EXIM policy of India. Export costing and pricing, Export procedures and export documentation. Export assistance and incentives in India.

Text books:

- International Marketing, Michael R. Czinkota, Likka A Ronkainen, Cengage .
- Global marketing Management , Keegan, Green, 4/e, Pearson

References:

- International Marketing Analysis and Strategy, SakOnkvisit, John J. Shaw, PHI.
- International Marketing, Philip R. Cateora, John L. Graham, Prasanth Salwan, TMH.
- International Marketing, Vasudeva PK, excel.
- Global Marketing, Management, Lee, Carter, Oxford.
- International Marketing and Export management, Albaum , Pearson Education.
- Global Marketing, Johansson, TMH.
- Integrated Marketing Management – Text and Cases, Mathur, Sage.

(17E00409) GLOBAL HUMAN RESOURCE MANAGEMENT
(Elective VI)

Objective : The objective of the course is to provide an outline of Global Human Resource management of MNC'S.

- 1. Global Human Resource Management concept**, expanding role – Global issues and challenges, Differences between Domestic HRM and GHRM.
- 2. Social and Cultural Variables in Global Organizations** – Cross Cultural Differences – Cross Cultural Research Methodologies – Hofetede's Hermes Study, Cultural Issues.
- 3. Global staffing and Compensation Practices** – Nature, Sources, Policies – Human Resource Planning – Recruitment and Selection for global Assignment, Selection process- Expatriate and Repatriate. – Compensation- International Compensation structure, Differentiating HCN'S, PCN'S and TCN'S
- 4. Appraisal and Training and development in the Global Perspective**- Programmes and Agencies– Performance management, Appraisal system – Training and development need, cross cultural training, Areas of international training and development.
- 5. Global Industrial Relations and People Management** – Trade Unions, Collective bargaining, Disputes/Conflicts, Quality Circles and Participative Management.- USA – European Countries, Asian Countries and Middle East.

Text books:

- International Human Resource Management, Aswathappa, TMH.
- International Dimension of Human Resource Management, Dowling P.J, Thomson/Cengage

References:

- International Human Resource Management, Tony Edwards & Chris Rees, Pearson.
- Internal Human Resource Management, Rao P.L, Excel.
- International Human Resource Management, Subba Rao P, Himalaya.
- International Dimensions of Organizational Behaviour, Adler N.J, Kent

(17E00410) CORPORATE INFORMATION MANAGEMENT
(Elective VI)

Objective: The objective of the course is to provide a broad outline of Information Technology and its application at corporate business units and to understand all the issues related to the IT management.

1. **IT planning and strategy tools:** Strategy analysis – environment analysis- Conducting strategy audit- Assessing opportunities and risks- Company –technology analysis – Industry –technology analysis Trajectories of technology.
2. **Extending the enterprise:** Organising for innovation –Collaboration- Understanding business networks: differentiation interdependence and ownership – Designing hybrid governance models- Building collaborative community- Emerging network business models.
3. **IT Alignments :** Building the case for IT- leveraging infrastructure and creating options- Components of internet working infrastructures –Rise of internet working – business implications, Managing IT services : Availability facilities- uninterruptible power –Delivery- climate control – security – New service models.
4. **IT outsourcing** - Managing risk through incremental outsourcing- Outsourcing advantages and disadvantages- Outsourcing opportunities- Managing relationships with outsourcing agencies, Coordination and control of IT :Development stages of IT in organising- Nolans’ model- Distributed data processing - Centralisation vs decentralisation- drivers toward user dominance- Drivers towards centralised policy- Coordination and location IT policy.
5. **Project management:** Project categories- Project management: stage in project – planning and controlling tools-Problems – Towards effective project management, Technology and innovation:Understanding technological developments- Technology cycles-. Creative idea generation- Employee creativity – R&D- Role in technology development.

Text Books:

- C,S,G,,Krishnamcharyulu and Lalitha R. *Management of Technology*, Himalaya
- Lynda M.Applegate, Robert D.Ausitn and F. Warren McFarlan, *Corporate Information strategy and Management*, TMH

References:

- SanjivaShnkar Dubey, *IT strategy and Management*, PHI.
- Parag Kulkarni *IT strategy for Business*, Oxford.
- V.K.Narayan, *Managing Technology and Innovation for competitive Advantage*, Pearson.
- C.K. Prahlad, *The New Age of Innovation*. TMH.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
MBA IV Semester

L	T	P	C
0	0	3	2

(17E00411) SEMINAR (Contemporary Issues on Business)

The objective of the seminar is to evaluate the skills required for the managers viz., communication skills, logical skills, analytical skills, presentation skills, persuasion skills, decision making skills acquired by the students in the course of M.B.A and to analyse the managerial capabilities.

Students are required to present a seminar on any contemporary issue of the business.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
MBA IV Semester

L	T	P	C
0	0	12	10

(17E00412) PROJECT WORK

Students are required to take up a project work, in which the student can choose any specific problem of Industry or Industry based project work. Alternatively it can be secondary source based or Field based project work. Before the commencement of the project work each student is required to submit a synopsis indicating the objectives, Methodology, Framework for analysis, Action plan with milestones in order to have clarity for the subsequent work. The project should have an internal faculty as guide. The student shall initiate project work immediately after II semester and evaluation shall take place in IV semester

References:

- Business Essentials: *Research Project*, Viva.
- Paul Oliver: *Writing Your Thesis*, Sage.
- M.K.Rampal&S.L.Gupta: *Project Report Writing*, Paragon International.
- Michael Jay Polonsky: David S Waller: *Designing and Managing a Research Project*, Sage.
- Surendra Kumar: *An Aid to Project Work*, Paragon International.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year - I Semester (2017-2018)

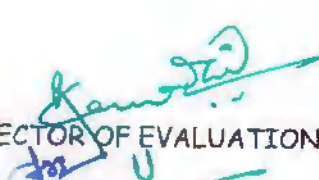
I Spell of Instructions:	30.06.2017 to 16.09.2017	(11 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	18.09.2017 to 23.09.2017	(06 days)
II Spell of Instructions:	25.09.2017 to 23.11.2017	(08 $\frac{1}{2}$ weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	24.11.2017 to 30.11.2017	(06 days)
Preparation and Practicals:	02.12.2017 to 08.12.2017	(06 days)
End Examinations:	11.12.2017 to 23.12.2017	(02 weeks)
Commencement of Class Work for B.Tech I Year II semester	08.01.2018 (Monday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.

First Notified on 29.06.2017

Rectified on 28.08.2017


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

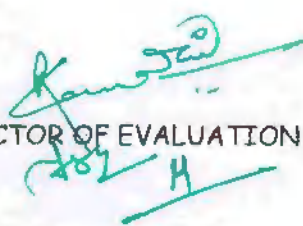
B.Tech/B.Pharm II, III & IV Years - I Semester (2017-2018)

I Spell of Instructions:	03.07.2017 to 01.09.2017	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	04.09.2017 to 11.09.2017	(06 days)
II Spell of Instructions:	12.09.2017 to 03.11.2017	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	04.11.2017 to 10.11.2017	(06 days)
Preparation and Practicals:	13.11.2017 to 18.11.2017	(06 days)
End Examinations:	20.11.2017 to 02.12.2017	(02 weeks)
Commencement of Class Work for IV Year B.Tech II semesters	14.12.2017 (Thursday)	
Commencement of Class Work for II & III Years B.Tech - II semesters	27.12.2017 (Wednesday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) II semester supplementary examinations will be conducted immediately after I semester regular and supplementary examinations

Date: 24.06.2017


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech I Year - II Semester (2017-2018)

I Spell of Instructions:	08.01.2018 to 09.03.2018	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	12.03.2018 to 14.03.2018	(03 days)
II Spell of Instructions:	15.03.2018 to 08.05.2018	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	09.05.2018 to 11.05.2018	(03 days)
Preparation and Practicals:	14.05.2018 to 19.05.2018	(06 days)
End Examinations:	21.05.2018 to 02.06.2018	(02 weeks)
Commencement of Class Work for II year B.Tech I semester for AY 2018-19	28.06.2018 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted both in the morning (9:00AM to 11:00AM) and afternoon (3:00PM to 05:00PM) sessions and they should be completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) I semester supplementary examinations will be conducted immediately after II semester end examinations

Date: 28.12.2017


Director of Evaluation



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

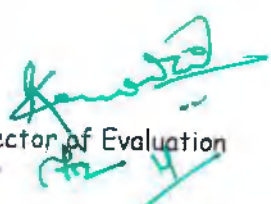
B.Tech/B.Pharm II & III Year - II Semester (2017-2018)

I Spell of Instructions:	27.12.2017 to 27.02.2018	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	28.02.2018 to 07.03.2018	(06 days)
II Spell of Instructions:	08.03.2018 to 02.05.2018	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	03.05.2018 to 09.05.2018	(06 days)
Preparation and Practicals:	10.05.2018 to 19.05.2018	(09 days)
End Examinations:	21.05.2018 to 02.06.2018	(02 weeks)
Commencement of Class Work for III & IV years B.Tech/B.Pharm I semester for AY 2018-19	28.06.2018 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) I semester supplementary examinations will be conducted immediately after II semester end examinations

Date: 28.12.2017


Director of Evaluation



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech IV Year II Semester (2017-2018)

First Unit of Instructions:	14.12.2017 to 03.02.2018	(07 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	05.02.2018 to 06.02.2018	(02 days)
Project work	07.02.2018 to 13.03.2018	(05 weeks)
II Unit of Instructions:	14.03.2018 to 11.04.2018	(04 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	12.04.2018 to 13.04.2018	(02 days)
End Examinations:	16.04.2018 to 23.04.2018	(07 days)
Project Viva Voce Examinations:	25.04.2018 to 04.05.2018	(09 days)

Note:

- (i) The Mid-term Examinations should be conducted both in the morning (9:00AM to 11:00AM) and afternoon (3:00PM to 05:00PM) sessions and they should be completed as per the schedule given.
- (ii) All the midterm examinations shall be of both subjective and objective type as per the academic regulations.

Date: 14.12.2017


Director of Evaluation



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

M.Tech & M.Pharm (AY 2017-18)

First Semester

(For 2017 admitted batch)

First Semester		
First Unit of Instructions	21.09.2017 to 15.11.2017	(08 Weeks)
First Mid Examinations	16.11.2017 to 22.11.2017	(06 Days)
Second Unit of Instructions	23.11.2017 to 24.01.2018	(09 Weeks)
Second Mid Examinations	25.01.2018 to 01.02.2018	(06 Days)
Preparation and Practicals	02.02.2018 to 09.02.2018	(07 Days)
End Examinations	12.02.2018 to 24.02.2018	(02 Weeks)
Commencement of class work for II Semester:	12.03.2018 (Monday)	

Date: 21-09-2017

Sd/-
DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)



ACADEMIC CALENDAR
for
Academic Year 2017-18

M.Tech / M.Pharm

Second Semester
(For 2017-18 admitted batches)

First Unit of Instructions	12.03.2018 to 04.05.2018	(08 Weeks)
First Mid Examinations	05.05.2018 to 11.05.2018	(06 Days)
Summer Vacation	14.05.2018 to 02.06.2018	(03 Weeks)
Second Unit of Instructions	04.06.2018 to 28.07.2018	(08 Weeks)
Second Mid Examinations	30.07.2018 to 04.08.2018	(06 Days)
Preparation and Practicals	06.08.2018 to 10.08.2018	(05 Days)
End Examinations	13.08.2018 to 28.08.2018	(02 Weeks)
Commencement of class work for III & IV Semester: (Academic Year 2018-19)	03.09.2018 (Monday)	

Notification Date: 13-03-2018


Director of Evaluation

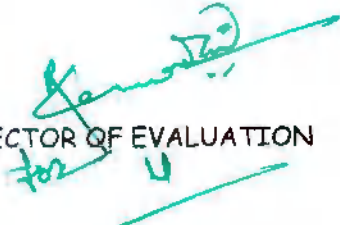
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

M.Tech/M.Pharm III & IV semesters (2017-2018)
(for 2016 - 2017 admitted batches)

Project work Schedule for 2016 admitted students	
Commencement of Project Work	14.08.2017
Submission of abstract to Internal Departmental Committee (IDC) for approval	03.10.2017 to 07.10.2017
Submission of status report at the end of first phase to IDC for approval	20.11.2017 to 25.11.2017
Submission of status report at the end of second phase to IDC for approval	08.01.2018 to 12.01.2018
Submission of status report at the end of third phase to IDC for approval	05.03.2018 to 09.03.2018
Pre - submission seminar	30.04.2018 to 05.05.2018
Final thesis/dissertation submission	After successful completion of presubmission seminar

Date: 12.09.2017


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for
Academic Year 2017-18

MBA / MCA

First Year
(For 2017-18 admitted batch)

First Semester		
First Unit of Instructions	21.08.2017 to 13.10.2017	(08 Weeks)
First Mid Examinations	16.10.2017 to 20.10.2017	(04 Days)
Second Unit of Instructions	21.10.2017 to 13.12.2017	(08 Weeks)
Second Mid Examinations	14.12.2017 to 18.12.2017	(04 Days)
Preparation and Practicals	19.12.2017 to 27.12.2017	(07 Days)
End Examinations	28.12.2017 to 11.01.2018	(13 Days)
Commencement of class work for II Semester:	22.01.2018 (Monday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 16-08-2017


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2017-18

M.B.A

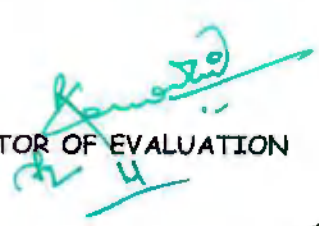
First Year

(For 2017-18 admitted batches)

Second Semester		
First Unit of Instructions	22.01.2018 to 17.03.2018	(08 Weeks)
First Mid Examinations	19.03.2018 to 22.03.2018	(04 Days)
Second Unit of Instructions	23.03.2018 to 03.05.2018	(06 Weeks)
Summer Vacation	04.05.2018 to 26.05.2018	(03½ Weeks)
Second Unit of Instructions (Continued)	28.05.2018 to 08.06.2018	(02 Weeks)
Second Mid Examinations	11.06.2018 to 14.06.2018	(04 Days)
Preparation and Practicals	15.06.2018 to 23.06.2018	(07 Days)
End Examinations	25.06.2018 to 09.07.2018	(13 Days)
Commencement of class work for III Semester:	16.07.2018 (Monday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 29-01-2018


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2017-18

M.B.A

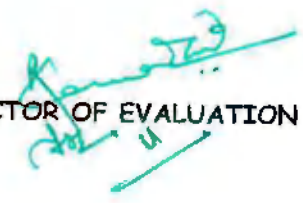
Second Year

(For 2016 admitted batch)

Third Semester		
First Unit of Instructions	17.07.2017 to 08.09.2017	(08 Weeks)
First Mid Examinations	11.09.2017 to 18.09.2017	(07 Days)
Second Unit of Instructions	19.09.2017 to 10.11.2017	(08 Weeks)
Second Mid Examinations	13.11.2017 to 20.11.2017	(07 Days)
Preparation and Practicals	21.11.2017 to 25.11.2017	(05 Days)
End Examinations	27.11.2017 to 13.12.2017	(13 Days)
Commencement of IV Semester	21.12.2017 (Thursday)	

- The midterm examinations should be conducted and completed as per the schedule given above.

Date: 14-07-2017


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

For the Year 2017-18

FOR

M.B.A

Second Year

(For 2016-17 admitted batches)

Fourth Semester		
First Unit of Instructions	21.12.2017 to 14.02.2018	(08 Weeks)
First Mid Examinations	15.02.2018 to 19.02.2018	(04 Days)
Second Unit of Instructions	20.02.2018 to 16.04.2018	(08 Weeks)
Second Mid Examinations	17.04.2018 to 20.04.2018	(04 Days)
Preparation and Project Work Viva Voce Examinations	21.04.2018 to 05.05.2018	(13 Days)
End Examinations	07.05.2018 to 14.05.2018	(07 Days)

- The midterm examinations should be conducted and completed as per the schedule given above.

Date: 28-12-2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year - I Semester (2017-2018)

I Spell of Instructions:	30.06.2017 to 16.09.2017	(11 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	18.09.2017 to 23.09.2017	(06 days)
II Spell of Instructions:	25.09.2017 to 23.11.2017	(08 $\frac{1}{2}$ weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	24.11.2017 to 30.11.2017	(06 days)
Preparation and Practicals:	02.12.2017 to 08.12.2017	(06 days)
End Examinations:	11.12.2017 to 23.12.2017	(02 weeks)
Commencement of Class Work for B.Tech I Year II semester	08.01.2018 (Monday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.

First Notified on 29.06.2017

Rectified on 28.08.2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

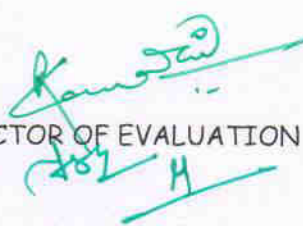
B.Tech/B.Pharm II, III & IV Years - I Semester (2017-2018)

I Spell of Instructions:	03.07.2017 to 01.09.2017	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	04.09.2017 to 11.09.2017	(06 days)
II Spell of Instructions:	12.09.2017 to 03.11.2017	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	04.11.2017 to 10.11.2017	(06 days)
Preparation and Practicals:	13.11.2017 to 18.11.2017	(06 days)
End Examinations:	20.11.2017 to 02.12.2017	(02 weeks)
Commencement of Class Work for IV Year B.Tech II semesters	14.12.2017 (Thursday)	
Commencement of Class Work for II & III Years B.Tech - II semesters	27.12.2017 (Wednesday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) II semester supplementary examinations will be conducted immediately after I semester regular and supplementary examinations

Date: 24.06.2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

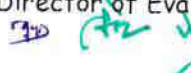
B.Tech I Year - II Semester (2017-2018)

I Spell of Instructions:	08.01.2018 to 09.03.2018	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	12.03.2018 to 14.03.2018	(03 days)
II Spell of Instructions:	15.03.2018 to 08.05.2018	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	09.05.2018 to 11.05.2018	(03 days)
Preparation and Practicals:	14.05.2018 to 19.05.2018	(06 days)
End Examinations:	21.05.2018 to 02.06.2018	(02 weeks)
Commencement of Class Work for II year B.Tech I semester for AY 2018-19	28.06.2018 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted both in the morning (9:00AM to 11:00AM) and afternoon (3:00PM to 05:00PM) sessions and they should be completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) I semester supplementary examinations will be conducted immediately after II semester end examinations

Date: 28.12.2017


Director of Evaluation




JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech/B.Pharm II & III Year - II Semester (2017-2018)

I Spell of Instructions:	27.12.2017 to 27.02.2018	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	28.02.2018 to 07.03.2018	(06 days)
II Spell of Instructions:	08.03.2018 to 02.05.2018	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	03.05.2018 to 09.05.2018	(06 days)
Preparation and Practicals:	10.05.2018 to 19.05.2018	(09 days)
End Examinations:	21.05.2018 to 02.06.2018	(02 weeks)
Commencement of Class Work for III & IV years B.Tech/B.Pharm I semester for AY 2018-19	28.06.2018 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) I semester supplementary examinations will be conducted immediately after II semester end examinations

Date: 28.12.2017


Director of Evaluation



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech IV Year II Semester (2017-2018)

First Unit of Instructions:	14.12.2017 to 03.02.2018	(07 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	05.02.2018 to 06.02.2018	(02 days)
Project work	07.02.2018 to 13.03.2018	(05 weeks)
II Unit of Instructions:	14.03.2018 to 11.04.2018	(04 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	12.04.2018 to 13.04.2018	(02 days)
End Examinations:	16.04.2018 to 23.04.2018	(07 days)
Project Viva Voce Examinations:	25.04.2018 to 04.05.2018	(09 days)

Note:

- (i) The Mid-term Examinations should be conducted both in the morning (9:00AM to 11:00AM) and afternoon (3:00PM to 05:00PM) sessions and they should be completed as per the schedule given.
- (ii) All the midterm examinations shall be of both subjective and objective type as per the academic regulations.

Date: 14.12.2017


Director of Evaluation



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

M.Tech & M.Pharm (AY 2017-18)

First Semester

(For 2017 admitted batch)

First Semester		
First Unit of Instructions	21.09.2017 to 15.11.2017	(08 Weeks)
First Mid Examinations	16.11.2017 to 22.11.2017	(06 Days)
Second Unit of Instructions	23.11.2017 to 24.01.2018	(09 Weeks)
Second Mid Examinations	25.01.2018 to 01.02.2018	(06 Days)
Preparation and Practicals	02.02.2018 to 09.02.2018	(07 Days)
End Examinations	12.02.2018 to 24.02.2018	(02 Weeks)
Commencement of class work for II Semester:	12.03.2018 (Monday)	

Date: 21-09-2017

Sd/-
DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)



ACADEMIC CALENDAR
for
Academic Year 2017-18

M.Tech / M.Pharm

Second Semester
(For 2017-18 admitted batches)

First Unit of Instructions	12.03.2018 to 04.05.2018	(08 Weeks)
First Mid Examinations	05.05.2018 to 11.05.2018	(06 Days)
Summer Vacation	14.05.2018 to 02.06.2018	(03 Weeks)
Second Unit of Instructions	04.06.2018 to 28.07.2018	(08 Weeks)
Second Mid Examinations	30.07.2018 to 04.08.2018	(06 Days)
Preparation and Practicals	06.08.2018 to 10.08.2018	(05 Days)
End Examinations	13.08.2018 to 28.08.2018	(02 Weeks)
Commencement of class work for III & IV Semester: (Academic Year 2018-19)	03.09.2018 (Monday)	

Notification Date: 13-03-2018


Director of Evaluation



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

M.Tech/M.Pharm III & IV semesters (2017-2018)
(for 2016 - 2017 admitted batches)

Project work Schedule for 2016 admitted students	
Commencement of Project Work	14.08.2017
Submission of abstract to Internal Departmental Committee (IDC) for approval	03.10.2017 to 07.10.2017
Submission of status report at the end of first phase to IDC for approval	20.11.2017 to 25.11.2017
Submission of status report at the end of second phase to IDC for approval	08.01.2018 to 12.01.2018
Submission of status report at the end of third phase to IDC for approval	05.03.2018 to 09.03.2018
Pre - submission seminar	30.04.2018 to 05.05.2018
Final thesis/dissertation submission	After successful completion of presubmission seminar

Date: 12.09.2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for
Academic Year 2017-18

MBA / MCA

First Year

(For 2017-18 admitted batch)

First Semester		
First Unit of Instructions	21.08.2017 to 13.10.2017	(08 Weeks)
First Mid Examinations	16.10.2017 to 20.10.2017	(04 Days)
Second Unit of Instructions	21.10.2017 to 13.12.2017	(08 Weeks)
Second Mid Examinations	14.12.2017 to 18.12.2017	(04 Days)
Preparation and Practicals	19.12.2017 to 27.12.2017	(07 Days)
End Examinations	28.12.2017 to 11.01.2018	(13 Days)
Commencement of class work for II Semester:	22.01.2018 (Monday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 16-08-2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2017-18

M.B.A

First Year

(For 2017-18 admitted batches)

Second Semester		
First Unit of Instructions	22.01.2018 to 17.03.2018	(08 Weeks)
First Mid Examinations	19.03.2018 to 22.03.2018	(04 Days)
Second Unit of Instructions	23.03.2018 to 03.05.2018	(06 Weeks)
Summer Vacation	04.05.2018 to 26.05.2018	(03½ Weeks)
Second Unit of Instructions (Continued)	28.05.2018 to 08.06.2018	(02 Weeks)
Second Mid Examinations	11.06.2018 to 14.06.2018	(04 Days)
Preparation and Practicals	15.06.2018 to 23.06.2018	(07 Days)
End Examinations	25.06.2018 to 09.07.2018	(13 Days)
Commencement of class work for III Semester:	16.07.2018 (Monday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 29-01-2018

DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2017-18

M.B.A

Second Year

(For 2016 admitted batch)

Third Semester		
First Unit of Instructions	17.07.2017 to 08.09.2017	(08 Weeks)
First Mid Examinations	11.09.2017 to 18.09.2017	(07 Days)
Second Unit of Instructions	19.09.2017 to 10.11.2017	(08 Weeks)
Second Mid Examinations	13.11.2017 to 20.11.2017	(07 Days)
Preparation and Practicals	21.11.2017 to 25.11.2017	(05 Days)
End Examinations	27.11.2017 to 13.12.2017	(13 Days)
Commencement of IV Semester	21.12.2017 (Thursday)	

- The midterm examinations should be conducted and completed as per the schedule given above.

Date: 14-07-2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

For the Year 2017-18

FOR

M.B.A

Second Year

(For 2016-17 admitted batches)

Fourth Semester		
First Unit of Instructions	21.12.2017 to 14.02.2018	(08 Weeks)
First Mid Examinations	15.02.2018 to 19.02.2018	(04 Days)
Second Unit of Instructions	20.02.2018 to 16.04.2018	(08 Weeks)
Second Mid Examinations	17.04.2018 to 20.04.2018	(04 Days)
Preparation and Project Work Viva Voce Examinations	21.04.2018 to 05.05.2018	(13 Days)
End Examinations	07.05.2018 to 14.05.2018	(07 Days)

- The midterm examinations should be conducted and completed as per the schedule given above.

Date: 28-12-2017


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year - I Semester (2019-2020)

Induction Program (zero semester)	05.08.2019 to 24.08.2019	(03 weeks)
I Spell of Instructions:	26.08.2019 to 11.10.2019	(07 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	14.10.2019 to 17.10.2019	(04 days)
II Spell of Instructions:	18.10.2019 to 19.12.2019	(09 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	20.12.2019 to 24.12.2019	(04 days)
Preparation and Practicals:	26.12.2019 to 01.01.2020	(06 days)
End Examinations:	02.01.2020 to 10.01.2020	(08 days)
Commencement of Class Work for B.Tech I Year II semester	20.01.2020 (Monday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.

Sd/-

DIRECTOR OF EVALUATION

Date: 03.08.2019

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech II, III & IV Years - I Semester (2019-2020)

I Spell of Instructions:	08.07.2019 to 31.08.2019	(08 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	03.09.2019 to 09.09.2019	(06 days)
II Spell of Instructions:	11.09.2019 to 08.11.2019	(09 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	11.11.2019 to 16.11.2019	(06 days)
Preparation and Practicals:	18.11.2019 to 23.11.2019	(06 days)
End Examinations:	25.11.2019 to 07.12.2019	(02 weeks)
Commencement of Class Work for IV Year B.Tech II semester	16.12.2019 (Monday)	
Commencement of Class Work for II & III Year B.Tech - II semesters	30.12.2019 (Monday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) II semester supplementary examinations will be conducted immediately after I semester regular and supplementary examinations

Date: 21.06.2019


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year - II Semester (2019-2020)

I Spell of Instructions:	20.01.2020 to 07.03.2020	(07 Weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	09.03.2020 to 13.03.2020	(05 Days)
II Spell of Instructions:	16.03.2020 to 16.05.2020	(09 Weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	18.05.2020 to 22.05.2020	(05 Days)
Preparation and Practicals:	23.05.2020 to 30.05.2020	(06 Days)
End Examinations:	01.06.2020 to 10.06.2020	(08 Days)
Commencement of Class Work for B.Tech II Year I semester for AY 2020-2021	25.06.2020 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.

Date: 20.01.2020


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech/B.Pharm II & III Year - II Semester (2019-2020)

I Spell of Instructions:	30.12.2019 to 28.02.2020	(09 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	29.02.2020 to 06.03.2020	(06 days)
II Spell of Instructions:	09.03.2020 to 01.05.2020	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	02.05.2020 to 08.05.2020	(06 days)
Preparation and Practicals:	11.05.2020 to 16.05.2020	(06 days)
End Examinations:	18.05.2020 to 30.05.2020	(02 weeks)
Commencement of Class Work for III & IV years B.Tech/B.Pharm I semester for AY 2020-2021	25.06.2020 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) I semester supplementary examinations will be conducted immediately after II semester end examinations

Date: 30.12.2019

Director of Evaluation

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech IV Year II Semester (2019-2020)

First Unit of Instructions:	16.12.2019 to 01.02.2020	(07 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	03.02.2020 to 04.02.2020	(02 days)
Project work	05.02.2020 to 11.03.2020	(05 weeks)
II Unit of Instructions:	12.03.2020 to 09.04.2020	(04 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	13.04.2020 to 15.04.2020	(02 days)
End Examinations:	16.04.2020 to 18.04.2020	(03 days)
Project Viva Voce Examinations:	20.04.2020 to 30.04.2020	(10 days)

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both subjective and objective type as per the academic regulations.

Sd/-

Date: 17.12.2019

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

M.Tech & M.Pharm (AY 2019-20)

First Semester

(For 2019 admitted batch)

First Semester		
First Unit of Instructions	16.09.2019 to 08.11.2019	(08 Weeks)
First Mid Examinations	11.11.2019 to 16.11.2019	(06 Days)
Second Unit of Instructions	18.11.2019 to 10.01.2020	(08 Weeks)
Second Mid Examinations	13.01.2020 to 21.01.2020	(06 Days)
Preparation and Practicals	22.01.2020 to 25.01.2020	(04 Days)
End Examinations	27.01.2020 to 07.02.2020	(02 Weeks)
Commencement of class work for II Semester:	24.02.2020 (Monday)	

Date: 13-09-2019


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)



ACADEMIC CALENDAR
for
Academic Year 2019-20

M.Tech / M.Pharm

Second Semester
(For 2019-20 admitted batches)

First Unit of Instructions	24.02.2020 to 18.04.2020	(08 Weeks)
First Mid Examinations	20.04.2020 to 25.04.2020	(06 Days)
Second Unit of Instructions	27.04.2020 to 08.05.2020	(02 Weeks)
Summer Vacation	11.05.2020 to 30.05.2020	(03 Weeks)
Second Unit of Instructions (Continued)	01.06.2020 to 10.07.2020	(06 Weeks)
Second Mid Examinations	13.07.2020 to 18.07.2020	(06 Days)
Preparation and Practicals	20.07.2020 to 25.07.2020	(06 Days)
End Examinations	27.07.2020 to 12.08.2020	(02½ Weeks)
Commencement of class work for III Semester: (Academic Year 2020-21)	24.08.2020 (Monday)	

Notification Date: 20-02-2020

Director of Evaluation

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

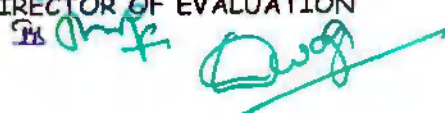
M.Tech & M.Pharm (AY 2019-20)

Third Semester

(For 2018 admitted batch)

Third Semester		
First Unit of Instructions	26.08.2019 to 19.10.2019	(08 Weeks)
First Mid Examinations	21.10.2019 to 23.10.2019	(03 Days)
Second Unit of Instructions	24.10.2019 to 24.12.2019	(09 Weeks)
Second Mid Examinations	26.12.2019 to 28.12.2019	(03 Days)
Preparation and Practicals	30.12.2019 to 04.01.2020	(05 Days)
End Examinations	06.01.2020 to 10.01.2020	(05 Days)
Commencement of class work for IV Semester:	20.01.2020 (Monday)	

Date: 22-08-2019

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DIRECTOR OF EVALUATION


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2019-20

M.Tech/M.Pharm

Fourth Semester

(For 2018-19 admitted batches)

IV Semester		
Commencement of Project Work Phose - II	20.01.2020 (Monday)	
Submission of status report Internal Departmental Committee (IDC) for approval	02.03.2020 to 07.03.2020	(01 Week)
Submission of status report IDC for approval	20.04.2020 to 25.04.2020	(01 Week)
Pre-submission seminar	01.06.2020 to 06.06.2020	(01 Week)
Final thesis/dissertation submission	After successful completion of presubmission seminar	

Date: 20-01-2020

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DIRECTOR OF EVALUATION
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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2019-20

MBA / MCA

First Year

(For 2019-20 admitted batch)

First Semester		
First Unit of Instructions	05.09.2019 to 30.10.2019	(08 Weeks)
First Mid Examinations	31.10.2019 to 04.11.2019	(04 Days)
Second Unit of Instructions	05.11.2019 to 30.12.2019	(08 Weeks)
Second Mid Examinations	31.12.2019 to 04.01.2020	(04 Days)
Preparation and Practicals	06.01.2020 to 16.01.2020	(07 Days)
End Examinations	17.01.2020 to 31.01.2020	(02 Weeks)
Commencement of class work for II Semester:	06.02.2020 (Thursday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 04-09-2019


DIRECTOR OF EVALUATION


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2019-20

M.B.A

First Year

(For 2019-20 admitted batches)

Second Semester		
First Unit of Instructions	06.02.2020 to 01.04.2020	(08 Weeks)
First Mid Examinations	03.04.2020 to 07.04.2020	(04 Days)
Second Unit of Instructions	08.04.2020 to 03.06.2020	(08 Weeks)
Second Mid Examinations	04.06.2020 to 08.06.2020	(04 Days)
Preparation and Practicals	09.06.2020 to 12.06.2020	(04 Days)
End Examinations	15.06.2020 to 29.06.2020	(13 Days)
Summer Vacation	30.06.2020 to 18.07.2020	(03 Weeks)
Commencement of class work for III Semester:	20.07.2020 (Monday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 04-02-2020

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DIRECTOR OF EVALUATION

Prof. S. S. S. S.



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2019-20

M.B.A

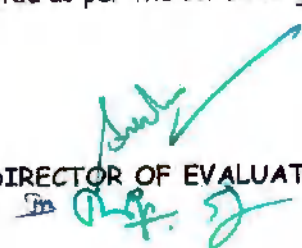
Second Year

(For 2018 admitted batch)

Third Semester		
First Unit of Instructions	08.07.2019 to 31.08.2019	(08 Weeks)
First Mid Examinations	03.09.2019 to 11.09.2019	(07 Days)
Second Unit of Instructions	12.09.2019 to 06.11.2019	(08 Weeks)
Second Mid Examinations	07.11.2019 to 15.11.2019	(07 Days)
Preparation and Practicals	16.11.2019 to 23.11.2019	(07 Days)
End Examinations	25.11.2019 to 09.12.2019	(14 Days)
Commencement of IV Semester	16.12.2019 (Monday)	

- The midterm examinations should be conducted and completed as per the schedule given above.

Date: 21-06-2019


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR
For the Year 2019-20

FOR

M.B.A
Second Year

(For 2018-19 admitted batches)

Fourth Semester		
First Unit of Instructions	16.12.2019 to 11.02.2020	(08 Weeks)
First Mid Examinations	12.02.2020 to 15.02.2020	(04 Days)
Second Unit of Instructions	17.02.2020 to 09.04.2020	(08 Weeks)
Second Mid Examinations	13.04.2020 to 17.04.2020	(04 Days)
Preparation and Project Work Viva Voce Examinations	18.04.2020 to 29.04.2020	(10 Days)
End Examinations	30.04.2020 to 11.05.2020	(09 Days)

- The midterm examinations should be conducted and completed as per the schedule given above.

Date: 17-12-2019

Sd/-
DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

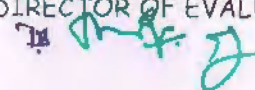
B.Tech I Year - I Semester (2020-2021)

Commencement of Class Work from: 06.01.2021		
I Spell Instructions	06.01.2021 to 17.01.2021	(10 Days)
I spell Instructions	18.01.2021 to 04.02.2021	(15 Days)
I spell Instructions	05.02.2021 to 23.02.2021	(15 Days)
II spell Instructions include I Mid Examinations	24.02.2021 to 13.03.2021	(15 Days)
II spell Instructions	15.03.2021 to 01.04.2021	(15 Days)
III spell Instructions	03.04.2021 to 12.04.2021	(10 Days)
III spell Instructions	15.04.2021 to 24.04.2021	(10 Days)
II Mid & Practical Examinations	26.04.2021 to 01.05.2021	(06 Days)
End Examinations	03.05.2021 to 10.05.2021	(08 Days)

Note:

All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.

Date: 08.01.2021


DIRECTOR OF EVALUATION


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

TENTATIVE ACADEMIC CALENDAR

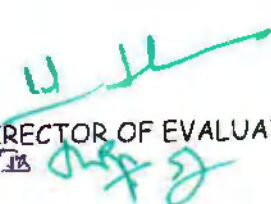
B.Tech II Year - I Semester (2020-2021)

I Spell of Instructions:	24.08.2020 to 12.10.2020	(07 weeks)
I Mid Examinations:	13.10.2020 to 18.10.2020	(06 days)
Dasara Holidays	19.10.2020 to 25.10.2020	(01 Week)
Previous Semester Practicals Examinations	26.10.2020 to 01.11.2020	(06 days)
Previous Semester II Mid & External Examinations	02.11.2020 to 11.11.2020	(10 days)
II Spell of Instructions:	12.11.2020 to 06.01.2021	(08 Weeks)
II Mid Examinations:	07.01.2021 to 12.01.2021	(06 days)
Preparation and Practicals:	13.01.2021 to 20.01.2021	(1 Week)
End Examinations:	21.01.2021 to 03.02.2021	(02 Weeks)

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.

Date: 04.09.2020


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

TENTATIVE ACADEMIC CALENDAR

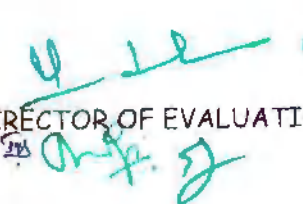
B.Tech/B.Pharm III & IV Years - I Semester (2020-2021)

I Spell of Instructions:	17.08.2020 to 11.10.2020	(08 Weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	12.10.2020 to 18.10.2020	(01 Week)
Dasara Holidays	19.10.2020 to 25.10.2020	(01 Week)
Previous Semester External Examinations	26.10.2020 to 08.11.2020	(02 Weeks)
II Spell of Instructions:	09.11.2020 to 03.01.2021	(08 Weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	04.01.2021 to 10.01.2021	(1 Week)
Preparation and Practicals:	11.01.2021 to 20.01.2021	(1½ Week)
End Examinations:	21.01.2021 to 03.02.2021	(02 Weeks)

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) II semester supplementary examinations will be conducted immediately after I semester regular and supplementary examinations

Date: 19.08.2020


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year – II Semester (2020-2021)

I Spell of Instructions:	06.05.2021 to 23.06.2021	(07 Weeks)
II Spell of Instructions:	24.06.2021 to 24.07.2021	(05½ Weeks)
I sem Mid Exams, practical classes & Practical Exams	02.08.2021 to 21.08.2021	(03 Weeks)
I semester End Examinations	23.08.2021 to 04.09.2021	(02 Weeks)
II Spell of Instructions (continued):	06.09.2021 to 29.09.2021	(03½ weeks)

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) The detailed academic calendar will be issued later.

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Date: Wed Jul 14 17:30:57 IST 2021

Date: 14.07.2021

DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

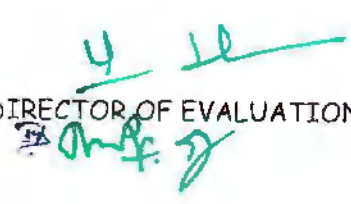
B.Tech/B.Pharm II & III Year - II Semester (2020-2021)

I Spell of Instructions:	08.04.2021 to 03.06.2021	(08 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	04.06.2021 to 10.06.2021	(06 days)
II Spell of Instructions:	11.06.2021 to 05.08.2021	(08 weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	06.08.2021 to 12.08.2021	(06 days)
Preparation and Practicals:	13.08.2021 to 21.08.2021	(06 days)
End Examinations:	23.08.2021 to 04.09.2021	(02 weeks)
Commencement of Class Work for III & IV years B.Tech/B.Pharm I semester for AY 2021-2022	16.09.2021 (Thursday)	

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) I semester supplementary examinations will be conducted immediately after II semester end examinations

Date: 07.04.2021


DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

Academic Calendar

B.Tech IV Year II Semester (2020-2021)

First Unit of Instructions:	15.03.2021 to 01.05.2021	(07 Weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	03.05.2021 to 04.05.2021	(02 Days)
Project work	05.05.2021 to 08.06.2021	(05 Weeks)
II Unit of Instructions:	09.06.2021 to 07.07.2021	(04 Weeks)
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	08.07.2021 to 09.07.2021	(02 Days)
End Examinations:	12.07.2021 to 14.07.2021	(03 Days)
Project Viva Voce Examinations:	15.07.2021 to 24.07.2021	(09 Days)

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both subjective and objective type as per the academic regulations.

Date: 15.03.2021


DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

M.Tech & M.Pharm (AY 2020-21)

First Semester

(For 2020 admitted batch)

First Semester		
First Unit of Instructions	22.02.2021 to 17.04.2021	(08 Weeks)
First Mid Examinations	19.04.2021 to 26.04.2021	(06 Days)
Second Unit of Instructions	27.04.2021 to 19.06.2021	(08 Weeks)
Second Mid Examinations	21.06.2021 to 26.06.2021	(06 Days)
Preparation and Practicals	28.06.2021 to 03.07.2021	(01 Week)
End Examinations	05.07.2021 to 17.07.2021	(02 Weeks)
Commencement of class work for II Semester:	02.08.2021 (Monday)	

Date: 20-02-2021

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DIRECTOR OF EVALUATION
[Signature]

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)



ACADEMIC CALENDAR
for
Academic Year 2020-21

M.Tech / M.Pharm

Second Semester
(For 2020-21 admitted batches)

First Unit of Instructions	21.06.2021 to 17.07.2021	(04 Weeks)
First Semester Mid Exams, practical classes & practical Exams	19.07.2021 to 02.08.2021	(02 Weeks)
Preparation Holidays	03.08.2021 to 07.08.2021	(01 Week)
I Semester End Examinations	09.08.2021 to 25.08.2021	(02½ Weeks)
First Unit of Instructions (continued)	26.08.2021 to 22.09.2021	(04 Weeks)

Note:

- (i) I Semester Online Mid Examination schedule will be intimated later.
- (ii) The detailed academic calendar will be issued later.

Date: 14-07-2021

DIRECTOR OF EVALUATION

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Date: Wed Jul 14 15:59:46 IST 2021

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for
Academic Year 2020-21

M.Tech/M.Pharm

Second Year

(For 2019 admitted batch)

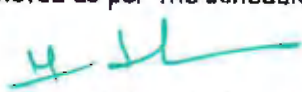
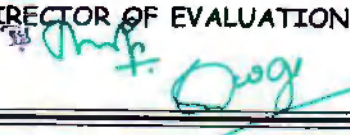
Online classes from 17.08.2020

III Semester		
Commencement of class work from 17.12.2020		
I spell instructions	17.12.2020 to 31.12.2020	Physical Mode
II spell instructions	02.01.2021 to 20.01.2021	Online Classes
III spell instructions	21.01.2021 to 03.02.2021	Physical Mode including I-Mid Exams
IV spell instructions	04.02.2021 to 20.02.2021	Physical Mode
IV spell instructions	22.02.2021 to 13.03.2021	Physical Mode
II Mid & Laboratory Examinations	15.03.2021 to 20.03.2021	(01 Week)
End Examinations	22.03.2021 to 26.03.2021	(05 Days)
Commencement of class work for IV Semester:	31.03.2021 (Wednesday)	

Note:

The Mid-term Examinations should be conducted and completed as per the schedule given.

Date: 12-02-2021


DIRECTOR OF EVALUATION


JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2020-21

M.Tech/M.Pharm

Fourth Semester

(For 2019-20 admitted batches)

IV Semester		
Commencement of Project Work Phase - II	31.03.2021 (Wednesday)	
Submission of status report Internal Departmental Committee (IDC) for approval	17.05.2021 to 22.05.2021	(01 Week)
Submission of status report IDC for approval	05.07.2021 to 12.07.2021	(01 Week)
Pre-submission seminar	16.08.2021 to 21.08.2021	(01 Week)
Final thesis/dissertation submission	After successful completion of presubmission seminar	

Date: 31-03-2021

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2020-21

MBA / MCA

First Year

(For 2020-21 admitted batch)

First Semester		
First Unit of Instructions	08.02.2021 to 03.04.2021	(08 Weeks)
First Mid Examinations	06.04.2021 to 09.04.2021	(04 Days)
Second Unit of Instructions	10.04.2021 to 04.06.2021	(08 Weeks)
Second Mid Examinations	05.06.2021 to 09.06.2021	(04 Days)
Preparation and Practicals	10.06.2021 to 16.06.2021	(06 Days)
End Examinations	17.06.2021 to 01.07.2021	(02 Weeks)
Commencement of class work for II Semester:	05.07.2021 (Monday)	

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.

Date: 05-02-2021

Sd/-
DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for
Academic Year 2020-21

MBA/MCA

First Year

(For 2020-21 admitted batches)

Second Semester		
First Unit of Instructions	14.06.2021 to 17.07.2021	(05 Weeks)
First Semester Mid Exams, practical classes & practical Exams	19.07.2021 to 02.08.2021	(02 Weeks)
Preparation Holidays	03.08.2021 to 07.08.2021	(01 Week)
I Semester End Examinations	09.08.2021 to 01.09.2021	(03½ Weeks)
First Unit of Instructions (continued)	02.09.2021 to 22.09.2021	(03 Weeks)
First Unit of Instructions	23.09.2021 to 17.11.2021	(08 Weeks)
I & II Mid Exams & Lab work	18.11.2021 to 03.12.2021	(14 Days)
Preparation & Practicals	04.12.2021 to 10.12.2021	(05 Days)
End Examinations	13.12.2021 to 28.12.2021	(02½ Weeks)
Commencement of class work for III Semester (AY 2021-22):	30.12.2021 (Thursday)	

Note:

The midterm examinations are to be conducted and completed as per the schedule given above.

Notified on 14-07-2021
Revised on 07-09-2021

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Date: Wed Sep 08 09:14:39 IST 2021

DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2020-21

M.B.A

Second Year

(For 2019 admitted batch)

Online classes from 17.08.2020

III Semester		
Re opening of Colleges 07.12.2020		
I spell instructions	07.12.2020 to 19.12.2020	Physical Mode
II spell instructions	21.12.2020 to 31.12.2020	Online Classes
III spell instructions	02.01.2021 to 19.01.2021	Physical Mode including I-Mid Exams
IV spell instructions	20.01.2021 to 31.01.2021	Physical Mode
V spell instructions	01.02.2021 to 17.02.2021	Physical Mode
VI spell instructions	18.02.2021 to 02.03.2021	Physical Mode
II-Mid Examinations	03.03.2021 to 10.03.2021	(07 Days)
Preparation & Laboratory Examinations	12.03.2021 to 17.03.2021	(05 Days)
End Examinations	18.03.2021 to 03.04.2021	(2½ Weeks)
Commencement of IV Semester	08.04.2021 (Thursday)	

Note:

The Mid-term Examinations should be conducted and completed as per the schedule given.

Date: 12-02-2021

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DIRECTOR OF EVALUATION
[Signature]



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

For the Year 2020-21

FOR

M.B.A

Second Year

(For 2019-20 admitted batches)

Fourth Semester		
First Unit of Instructions	08.04.2021 to 03.06.2021	(08 Weeks)
Second Unit of Instructions	04.06.2021 to 31.07.2021	(08 Weeks)
I & II Mid and Project Work Viva Voce Examinations	02.08.2021 to 21.08.2021	(03 Weeks)
End Examinations	23.08.2021 to 31.08.2021	(07 Days)

- The midterm examinations should be conducted and completed as per the schedule given above.

Notified on 07-04-2021

Revised on 27-07-2021

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EDDULA
Date: Tue Jul 27 12:52:30 IST 2021

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year - I Semester (2021-2022)

Induction Program (zero semester)	25.11.2021 to 15.12.2021	(03 weeks)
I Spell of Instructions:	16.12.2021 to 01.02.2022	(07 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	02.02.2022 to 05.02.2022	(04 days)
II Spell of Instructions:	07.02.2022 to 07.04.2022	(09 weeks)
Issue of Examination Notification	21.03.2022 (Monday)	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	01.04.2022 (Friday) (Presumptive week from 02.04.2022 to 07.04.2022)	
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	08.04.2022 to 12.04.2022	(04 days)
Preparation and Practicals:	16.04.2022 to 20.04.2022	(05 days)
End Examinations:	21.04.2022 to 30.04.2022	(10 Days)

Note:

- The Mid-term Examinations should be conducted and completed as per the schedule given.
- All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

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Date: Tue Nov 23 18:56:38 IST 2021

Date: 23.11.2021

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech II Year - I Semester (2021-2022)

I Spell of Instructions:	01.12.2021 to 25.01.2022	(08 Weeks)
I Mid-Term Examinations:	27.01.2022 to 29.01.2022	(03 Days)
II Spell of Instructions:	31.01.2022 to 26.03.2022	(08 Weeks)
Issue of End Examination Notification	07.03.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	21.03.2022 (Monday) (Presumptive week from 21.03.2022 to 26.03.2022)	(01 Week)
II Mid-Term Examinations:	28.03.2022 to 30.03.2022	(03 Days)
Preparation and Practicals:	31.03.2022 to 06.04.2022	(06 Days)
End Examinations:	07.04.2022 to 23.04.2022	(02½ Weeks)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.
- All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

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Date: Mon Nov 29 15:28:24 IST 2021

Date: 29.11.2021

DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech/B.Pharm III & IV Years - I Semester (2021-2022)

Proposed by the University		
Commenced from	08.10.2021	
I Spell of Instructions:	08.10.2021 to 01.12.2021	(08 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	02.12.2021 to 04.12.2021	(03 days)
II Spell of Instructions:	06.12.2021 to 29.01.2022	(08 weeks)
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	24.01.2022 (Monday) (Presumptive week from 24.01.2022 to 29.01.2022)	
Issue of Examination Notification	25.01.2022	
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	31.01.2022 to 02.02.2022	(03 days)
End laboratory Examinations:	03.02.2022 to 09.02.2022	(06 days)
End Theory Examinations:	10.02.2022 to 26.02.2022	(02½ weeks)
Commencement of Class Work for III & IV Years B.Tech/B.Pharm II semester	28.02.2022 (Monday)	

Note:

- The Mid-term Examinations should be conducted and completed as per the schedule given.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 07.10.2021

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DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech I Year - II Semester (2021-2022)

I Spell of Instructions:	12.05.2022 to 06.07.2022	(08 weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	07.07.2022 to 12.07.2022	(04 days)
II Spell of Instructions:	13.07.2022 to 05.09.2022	(08 weeks)
Issue of Examination Notification	16.08.2022 (Tuesday)	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	30.08.2022 (Tuesday) (Presumptive week from 30.08.2022 to 05.09.2022)	
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	06.09.2022 to 09.09.2022	(04 days)
Preparation and Practicals:	12.09.2022 to 17.09.2022	(06 days)
End Examinations:	19.09.2022 to 01.10.2022	(02 weeks)

Note:

- (i) The Mid-term Examinations should be conducted and completed as per the schedule given.
- (ii) All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- (iii) For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 11.05.2022

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EDDULA
Date: Wed May 11 11:53:56 IST 2022

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech II Year - II Semester (2021-2022)

I Spell of Instructions:	25.04.2022 to 18.06.2022	(08 Weeks)
I Mid-Term Examinations:	20.06.2022 to 22.06.2022	(03 Days)
II Spell of Instructions:	23.06.2022 to 16.08.2022	(08 Weeks)
Issue of End Examination Notification	25.07.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	10.08.2022 (Wednesday) (Presumptive week from 10.08.2022 to 16.08.2022)	(01 Week)
II Mid-Term Examinations:	17.08.2022 to 20.08.2022	(03 Days)
Preparation and Practicals:	22.08.2022 to 27.08.2022	(06 Days)
End Examinations:	29.08.2022 to 09.09.2022	(02 Weeks)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.
- All the midterm examinations shall be of both objective and descriptive type as per the academic regulations.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 20.04.2022

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Date: Wed Apr 20 16:03:17 IST 2022

DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech/B.Pharm III Year - II Semester (2021-2022)

Commenced from	14.03.2022	
I Spell of Instructions:	14.03.2022 to 07.05.2022	(08 Weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	09.05.2022 to 16.05.2022	(01 Week)
II Spell of Instructions:	17.05.2022 to 08.07.2022	(08 Weeks)
Issue of Examination Notification	20.06.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	02.07.2022 (Saturday) (Presumptive week from 02.07.2022 to 08.07.2022)	
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	11.07.2022 to 16.07.2022	(01 Week)
End Laboratory Examinations	18.07.2022 to 23.07.2022	(01 Week)
End Theory Examinations:	25.07.2022 to 06.08.2022	(02 Weeks)

Note:

- The Mid-term Examinations should be conducted and completed as per the schedule given.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 26.02.2022

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Date: Sat Feb 26 15:27:15 IST 2022

DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR, ANANTHAPURAMU

ACADEMIC CALENDAR

B.Tech IV Years - II Semester (2021-2022)

Commenced from	03.03.2022	
I Spell of Instructions:	03.03.2022 to 21.04.2022	(07 Weeks)
I Mid-term Examinations: (1 st Objective + 1 st descriptive)	22.04.2022 to 23.04.2022	(02 Days)
Project work	25.04.2022 to 28.05.2022	(05 Weeks)
II Spell of Instructions:	30.05.2022 to 25.06.2022	(04 Weeks)
Issue of Examination Notification	02.06.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	20.06.2022 (Monday) (Presumptive week from 20.06.2022 to 25.06.2022)	
II Mid-term Examinations: (2 nd Objective + 2 nd descriptive)	27.06.2022 to 28.06.2022	(02 Days)
End Theory Examinations:	29.06.2022 to 01.07.2022	(03 Days)
Project Viva Voce Examinations:	02.07.2022 to 14.07.2022	(10 Days)

Note:

- The Mid-term Examinations should be conducted and completed as per the schedule given.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

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Date: Sat Feb 26 16:06:38 IST 2022

Date: 26.02.2022

DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

M.Tech/M.Pharm

I Year - I Semester

(For 2021-22 admitted batches)

I Semester		
I spell of Instructions	24.01.2022 to 19.03.2022	(08 Weeks)
I Mid-Term Examinations	21.03.2022 to 24.03.2022	(04 Days)
II spell of Instructions	25.03.2022 to 19.05.2022	(08 Weeks)
I Mid-Term Examinations	20.05.2022 to 24.05.2022	(04 Days)
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	13.05.2022 (Friday) (Presumptive week from 12.05.2022 to 19.05.2022)	
Issue of Examination notification	28.04.2022	
Preparation & Practicals	25.05.2022 to 28.05.2022	(04 Days)
End Examinations	30.05.2022 to 15.06.2022	(02½ Weeks)

Note:

- The midterm examinations are to be conducted and completed as per the schedule given above
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 19-01-2022

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EDDULA
Date: Wed Jan 19 16:50:30 IST 2022

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

M.Tech/M.Pharm

I Year - II Semester

(For 2021-22 admitted batches)

II Semester		
I spell of Instructions	22.06.2022 to 12.08.2022	(08 Weeks)
I Mid-Term Examinations	16.08.2022 to 20.08.2022	(04 Days)
II spell of Instructions	22.08.2022 to 07.10.2022	(07 Weeks)
II Mid-Term Examinations	10.10.2022 to 13.10.2022	(04 Days)
Preparation & Practicals	14.10.2022 to 19.10.2022	(05 Days)
End Examinations	20.10.2022 to 29.10.2022	(08 Days)
Commencement of Class Work for III semester	07.11.2022 (Monday)	

Note:

- The midterm examinations are to be conducted and completed as per the schedule given above.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on Notional Holidays and important festivals.

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Date: Tue Jun 21 16:33:35 IST 2022

Date: 21-06-2022

DIRECTOR OF EVALUATION

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

M.Tech

III Semester

(For 2020 Admitted Batch)

III Semester		
I spell of Instructions	17.01.2022 to 05.03.2022	(07 Weeks)
I Mid-Term Examinations	07.03.2022 to 09.03.2022	(03 Days)
II spell of Instructions	10.03.2022 to 04.05.2022	(08 Weeks)
II Mid-Term Examinations	05.05.2022 to 07.05.2022	(03 Days)
Issue of Examination notification	07.04.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	28.04.2022 (Thursday) (Presumptive week from 28.04.2022 to 04.05.2022)	
University Practicals Examinations	09.05.2022 to 13.05.2022	(05 Days)
University Theory Examinations	16.05.2022 to 28.05.2022	(02 Weeks)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 18-01-2022

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EDDULA

Date: Tue Jan 18 16:33:25 IST 2022

DIRECTOR OF EVALUATION

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

M.Tech/M.Pharm

Fourth Semester

(For 2020-21 admitted batches)

IV Semester	
Commencement of Project Work Phase - II	06.06.2022 (Monday)
Submission of Abstract	27.06.2022
Preliminary Seminar on Abstract	04.07.2022 to 06.07.2022
1 st Review Seminar	01.08.2022 to 03.08.2022
2 nd Review Seminar	29.09.2022 to 01.10.2022
Pre-submission seminar	07.11.2022 onwards
Submission of Dissertation & Viva-Voce	After Successful Completion of the Pre-Submission Seminar

Notified on 01-06-2022

Revised on 12-07-2022

Digitally signed by KESHAVA REDDY
EDDULA
Date: Tue Jul 12 16:41:18 IST 2022

DIRECTOR OF EVALUATION





JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

MBA/MCA

I Semester

(For 2021 Admitted Batch)

I Semester		
I spell of Instructions	03.01.2022 to 28.02.2022	(08 Weeks)
I Mid-Term Examinations	02.03.2022 to 05.03.2022	(04 Days)
II spell of Instructions	07.03.2022 to 30.04.2022	(08 Weeks)
II Mid-Term Examinations	02.05.2022 to 06.05.2022	(04 Days)
Issue of Examination notification	07.04.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	30.04.2022 (Saturday) (Presumptive week from 30.04.2022 to 06.05.2022)	
University Practicals Examinations	07.05.2022 to 13.05.2022	(06 Days)
University Theory Examinations	16.05.2022 to 30.05.2022	(13 Days)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

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Date: Thu Dec 30 12:24:08 IST 2021

Date: 30-12-2021

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

MBA/MCA

II Semester

(For 2021 Admitted Batch)

II Semester		
I spell of Instructions	06.06.2022 to 30.07.2022	(08 Weeks)
I Mid-Term Examinations	01.08.2022 to 04.08.2022	(04 Days)
II spell of Instructions	05.08.2022 to 30.09.2022	(08 Weeks)
Issue of Examination notification	12.09.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	24.09.2022 (Saturday) (Presumptive week from 24.09.2022 to 30.09.2022)	
II Mid-Term Examinations	01.10.2022 to 07.10.2022	(04 Days)
University Practicals Examinations	10.10.2022 to 15.10.2022	(06 Days)
University Theory Examinations	17.10.2022 to 31.10.2022	(02 Weeks)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

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Date: Sat May 28 16:47:14 IST 2022

Date: 28-05-2022

DIRECTOR OF EVALUATION

[Signature]



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

MBA/MCA

III Semester

(For 2020-21 admitted batches)

III Semester		
I spell of Instructions	20.12.2021 to 12.02.2022	(08 Weeks)
I Mid-Term Examinations	14.02.2022 to 17.02.2022	(04 Days)
II spell of Instructions	18.02.2022 to 16.04.2022	(08 Weeks)
II Mid-Term Examinations	18.04.2022 to 21.04.2022	(04 Days)
Issue of Examination notification	24.03.2022	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	08.04.2022 (Friday) (Presumptive week from 07.04.2022 to 16.04.2021)	
University Practicals Examinations	22.04.2022 to 27.04.2022	(05 Days)
University Theory Examinations	28.04.2022 to 13.05.2022	(02 Weeks)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above.
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

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EDDULA
Date: Sat Dec 18 17:15:04 IST 2021

Date: 18-12-2021

DIRECTOR OF EVALUATION



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
ANANTHAPURAMU - 515002, A.P (INDIA)

ACADEMIC CALENDAR

for

Academic Year 2021-22

MBA

IV Semester

(For 2020-21 admitted batches)

IV Semester		
I spell of Instructions including project work:	16.05.2022 to 08.07.2022	(08 Weeks)
I Mid-Term Examinations	11.07.2022 to 14.07.2022	(04 Days)
II spell of Instructions including project work:	15.07.2022 to 08.09.2022	(08 Weeks)
II Mid-Term Examinations	09.09.2022 to 14.09.2022	(04 Days)
Issue of Examination notification	18.08.2022 (Thursday)	
Finalization & submission of attendance to University (considering presumptive attendance for a period of one week)	02.09.2022 (Friday) (Presumptive week from 02.09.2022 to 08.09.2022)	
Project Work Viva Voce Examinations	15.09.2022 to 24.09.2022	(09 Days)
University Theory Examinations	26.09.2022 to 13.10.2022	(02½ Weeks)

Note:

- The midterm examinations are to be conducted during both forenoon and afternoon sessions and are to be completed as per the schedule given above
- For slippage of working days due to any unavoidable reasons, compensation can be made by conducting class work on second Saturdays, Sundays and other holidays, except on National Holidays and important festivals.

Date: 12-05-2022

Digitally signed by KESHAVA REDDY
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Date: Thu May 12 15:30:59 IST 2022

DIRECTOR OF EVALUATION

85 M

SVR ENGINEERING COLLEGE: NANDYAL

Year: II	Semester: 1I	Program: B.Tech-ECE	MID: I	Total Marks :15
Course Name: Electronic Circuits- Analysis and Design		Course Code: 19A04402T		Date: 14-08-2021 Time: 90 Minutes

Answers the following Questions & All questions carry equal Marks.

CO: Course Outcome no, **BTL:** Bloom's Taxonomy Level no.

Q		CO	BTL	Marks
1	Explain small signal analysis of common source amplifier for JFET. (OR) Explain small signal analysis of basic CE amplifier circuit.	1	4	5
2		1	4	5
3	Compare three basic amplifier configurations for MOSFET. (OR) Analyze the frequency response of single stage amplifier using BJT.	1	4	5
4		2	4	5
5	Explain the effect of load, bypass and coupling capacitor on transistor amplifiers circuits. (OR) Analyze the frequency response of single stage amplifier using FET.	2	2	5
6		2	4	5

Bloom's Taxonomy Levels

Level	BT-1	BT-2	BT-3	BT-4	BT-5	BT-6
Competence	Remember	Understand	Apply	Analyze	Evaluate	Create

SVR ENGINEERING COLLEGE:: NANDYAL

Year: II	Semester: 1I	Program: B.Tech-ECE	MID: I	Total Marks :15
Course Name: ACS		Course Code: 19A04403T	Date: 17.08.21 FN Time:90 Minutes	

Answers the following Questions & All questions carry equal Marks.

CO : Course Outcome no, **BTL:** Bloom's Taxonomy Level No.

Q		CO	BTL	Marks
1	a. Explain the block diagram of general communication system with neat sketch	1	2	3
	b. What is Modulation? Mention the advantages of modulation (OR)		1	2
2	Explain the generation and demodulation of Amplitude Modulation with neat sketches	1	2	5
3	Explain the generation and demodulation of SSB-SC (OR)	1	2	5
4	Explain the generation of FM using Direct method	2	2	5
5	Explain the block diagram of FDM with neat sketch (OR)	2	2	5
6	Explain with help of neat circuit diagram and phasor diagrams of Foster seeley discriminator	2	2	5

Bloom's Taxonomy Levels

Level	BT-1	BT-2	BT-3	BT-4	BT-5	BT-6
Competence	Remember	Understand	Apply	Analyze	Evaluate	Create

SVR ENGINEERING COLLEGE: NANDYAL

Year: III	Semester: II	Program: B.Tech-ECE A&B	MID: I	Total Marks :15
Course Name: MPMC SET-I		Course Code: 19A04601T	Date: 12-05-2022 Time: 90 Minutes	

Answers the following Questions & All questions carry equal Marks.

CO:Course Outcome no, **BTL:** Bloom's Taxonomy Level no.

Q		CO	BTL	Marks
1	Draw and explain the architecture of 8085 microprocessor (OR)	1	2	5
2	Draw and explain the architecture of 8086 microprocessor	1	2	5
3	Explain arithmetic and logical instruction set of 8086 with example (OR)	2	2	5
4	Explain the assembler directives of 8086	2	2	5
5	Explain the pin diagram of 8255 PPI (OR)	3	2	5
6	Explain the modes of operation of 8255 PPI	3	2	5

Bloom's Taxonomy Levels

Level	BT-1	BT-2	BT-3	BT-4	BT-5	BT-6
Competence	Remember	Understand	Apply	Analyze	Evaluate	Create

SVR ENGINEERING COLLEGE:: NANDYAL

Year: IV	Semester: I	Program: B.Tech ECE	MID: II	Total Marks : 30
Course Name: MWE		Course Code: 15A04703		Date: 01-02-22FN Time: 90 Minutes

Answer Any THREE Questions. Each question carries 10 marks.

CO:Course Outcome no, **BTL:** Bloom's Taxonomy Level no.

Q			CO	BTL	Marks
1		With Neat Sketches explain the principle & operation of Two Cavity Klystron and derive the expression for velocity modulation.	3	2	10
2		Discuss about helix TWT with neat diagram and derive the expression.	3	2	10
3		With Neat diagram derive the Hull Cut-off conditions in cylindrical Magnetron.	4	5	10
4	a	Classify various Microwave solid state devices.	4	2	5
	b	Explain the VI Characteristics of Gunn Diode.	4	2	5
5		Explain the procedure to measure the Attenuation using R.F substitution method and power ratio method with block diagrams	5	2	10

Bloom's Taxonomy Levels

Level	BT-1	BT-2	BT-3	BT-4	BT-5	BT-6
Competence	Remember	Understand	Apply	Analyze	Evaluate	Create

SVR ENGINEERING COLLEGE::NANDYAL

Year : II (SET-I)	Semester : I (2021-2022)	Program : B.Tech – ECE – A&B	MID:II (Descriptive)	Total Marks:15 Time: 90 Min
Course Name: CVT		Course Code:20A54302		Date: 28-03-2022

Answer ALL THREE Questions, Each question carries 5 Marks

CO: Course Outcome no, **BTL:** Bloom's Taxonomy Level no

Q			CO	BTL	Marks
1	A	Find $L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$ by using convolution theorem.	3	1	5
		OR			
	B	Solve $(D^2 + n^2)x = a \sin(nt + \alpha)$, $x = Dx = 0$ at $t = 0$	3	3	5
2	A	Find the Fourier series of the function $f(x) = x - x^2$ in $-\pi < x < \pi$ And hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots = \frac{\pi^2}{12}$.	4	1	5
		OR			
	B	Expand $f(x) = e^{-x}$ as a Fourier series $(-1,1)$.	4	2	5
3	A	Using the Z transform ,solve $u_{n+2}-2u_{n+1}+u_n=3n+5$.	5	3	5
		OR			
	B	Find the Fourier transform of $f(x)=xe^{-x}$	5	1	5

Bloom's Taxonomy Levels

Level	BT-1	BT-2	BT-3	BT-4	BT-5	BT-6
Competence	Remember	Understand	Apply	Analyze	Evaluate	Create

SVR ENGINEERING COLLEGE::NANDYAL

Year : II	Semester : I	Program : B.Tech ECE	MID: II	Total Marks:15
Course Name: MEFA		Course Code: 20A52301		Date: 02-02-2022 Time: 90 Min

Answer any THREE Questions, Each question carries 5 Marks

CO: Course Outcome no, BTL: Bloom's Taxonomy Level no

Q			CO	BTL	Marks
1	A	Explain features advantages and dis advantages of partnership?	3	4	5
	OR				
	B	3. Journalize the following transactions in books of barathi? 2022 January 1 introduced cash,furniture			

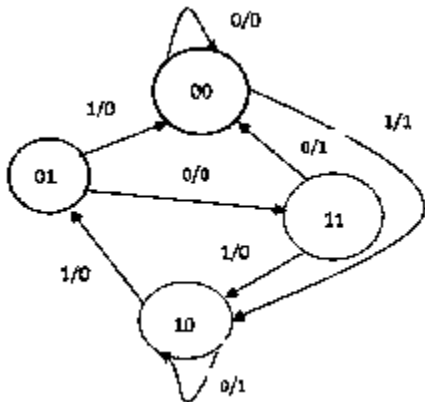
SVR ENGINEERING COLLEGE:: NANDYAL

SET-I

Year: II	Semester: I	Program: B.Tech-EEE	MID: II	Total Marks :15
Course Name: DIGITAL LOGIC DESIGN		Course Code: 20A04303T		Date: 29:03:2022 AN Time: 90 Min

Answers the following Questions & All questions carry equal Marks..

CO :Course Outcome no, **BTL**: Bloom's Taxonomy Level no.

Q		CO	BTL	Marks
1	Design a mod-10 synchronous counter using JK flip flops. Write excitation table and state table. (OR)	3	4	5
2	Describe 4-bit Universal shift register with a neat diagram	3	5	5
3	A sequential circuit has one input and one output .The state diagram is shown below. Design the sequential circuit with D flip-flops. 	4	5	5
4	(OR) a) What are the Moore and Melay machines? Compare them. b) Explain the procedure for state minimization using the partition technique with example	4	2	5
5	Design a Finite state machine which can detect a sequence of 1111 (Overlapping output) using JK Flip-flops. (OR)	4	6	5
6	Convert D -flip flop into T, JK and SR flip flop.	3	4	5

Bloom's Taxonomy Levels

Level	BT-1	BT-2	BT-3	BT-4	BT-5	BT-6
Competence	Remember	Understand	Apply	Analyze	Evaluate	Create

SVR ENGINEERING COLLEGE:: NANDYAL – 518 503

I-Objective Examinations – March – 2022

Class : II – B.Tech, I Semester
Subject : Digital logic Design (20A04303T)
Branch : EEE

Date : 29-03-2022 AN
Maximum Marks : 10 Marks
Time : 20 Minutes

Signature of the Invigilator:

Roll No.

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All Questions carrying equal marks

- 1) What is/are the crucial function/s of memory elements used in the sequential circuits? []
a) Storage of binary information b) Specify the state of sequential
c) Both a & b d) None of the above
- 2) In Moore models, output are the function of only []
a) Present state b) input state c) next state d) both a and b
- 3) The flip-flops can be constructed with two []
a) NAND gates b) XOR gates c) AND gates d) NOT gates
- 4) Unused states are treated as don't cares conditions during the []
a) Design of a circuit b) Execution c) Pulse trigger d) none
- 5) The positive transition in flip-flops is referred as []
a) CLOCK b) negative edge c) positive edge d) Both a & b
- 6) One that is not the type of flip-flop is []
a) JK b) T c) RS d) UT
- 7) How many test patterns are required to test the circuit using counters? []
a) 2^n b) $2^{(n-1)}$ c) $2^n - 1$ d) $2^n + 1$
- 8) Finite state machines are used for []
a) Deterministic test patterns b) algorithmic test patterns
c) random test patterns d) pseudo random test patterns
- 9) One example of the use of an S-R flip-flop is as []
a) Transition pulse generator b) Racer
c) Switch debouncer d) Astable oscillator
- 10) What happens if the input is high in FSM? []
a) Change of state b) No transition in state
c) Remains in a single state d) Invalid state
11. The FPGA refers to_____.
12. Moore machine has_____states than a mealy machine.
13. State transition happens_____in every clock cycle.
14. A basic S-R flip-flop can be constructed by cross-coupling of which basic logic gates? _____
15. How many types of sequential circuits are? _____
16. Finite state machines are combinational logic systems. (True/False) []
17. Counters detect only bridging faults (True/False) []
18. The basic latch consists of two invertors (True/False) []
19. In S-R flip-flop, if $Q = 0$ the output is said to be reset (True/False) []
20. The inputs in the PLD is given through AND Gates. (True/False) []

SVR ENGINEERING COLLEGE :: NANDYAL**II-Mid-Objective Examinations, NOV – 2019**

Class : II B. Tech, II – Semester
Subject : Electronic Devices & Circuits
Branch : Common to EEE & ECE

Date : 15-11-2019
Maximum Marks : 10 Marks
Time : 20 Minutes

Signature of the Invigilator:

Roll No.

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All Questions carrying equal marks

1. Due to early effect, I_B []
a) Decreases b) Increases c) Constant d) None
2. FET application is []
a) Switch b) Amplifier c) a & b d) None
3. For Transistor amplifier, Emitter junction & collector junctions are respectively []
a) FB, RB b) FB, FB c) RB, FB d) RB, RB
4. Emitter follower is []
a) CE b) CB c) CC d) none
5. CE current gain is []
a) α b) β c) γ d) none
6. Which among the following is a buffer Amplifier ($A_{v<1}$)? []
a) CE b) CB c) CC d) none
7. Among all biasing techniques, which is best? []
a) Fixed b) Collector to base c) Self d) Two battery
8. $S=1$ for []
a) Fixed b) Collector to base c) Self d) Two battery
9. Which device is voltage controlled device? []
a) CE b) CB c) FET d) CC
10. Which amplifier is having moderate voltage gain and moderate current gain. []
a) CD b) CS c) CG d) none
11. Compare BJT and FET?
12. Draw the symbol of N channel JFET.
13. Draw the symbol of N channel E-MOSFET.
14. Draw BJT transistor small signal low frequency hybrid model.
15. Draw JFET transistor small signal low frequency hybrid model. .
16. FET is current controlled device. (T/F) []
17. BJT is voltage controlled device. (T/F) []
18. CD amplifier is source follower. (T/F) []
19. For ac analysis, capacitors are short circuit and dc supply given to ground. (T/F) []
20. For small signal, h parameter model is used. (T/F) []

SVR ENGINEERING COLLEGE :: NANDYAL

I-Mid-Objective Examinations, Aug – 2021

Class : II B.Tech. II – Semester

Date : 14-08-2021

Subject : Electronic Circuits- Analysis and Design

Maximum Marks : 10 Marks

Branch : ECE

Time : 20 Minutes

Signature of the Invigilator:

Roll No.

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All Questions carrying equal marks

1. H-Parameters are preferred over other parameters due to []
a) They can convert from one configuration to other configuration easily
b) Readily supplied by manufacturers c) They are easy to measured d) All of the above
2. Which amplifier has approximately unit voltage gain []
a) Common Collector Amplifier b) Common Emitter Amplifier
c) Common Base Amplifier d) None of the above
3. Which amplifier is suitable for power amplification []
a) Common Collector Amplifier b) Common Emitter Amplifier
c) Common Base Amplifier d) None of the above
4. Which device is used as a voltage variable resistor []
a) BJT b) JFET c) P N diode d) Zener Diode
5. The relation between μ , g_m and r_d is []
a) $\mu = g_m + r_d$ b) $\mu = g_m * r_d$ c) $\mu = g_m / r_d$ d) $\mu = g_m - r_d$
6. FET is preferred over BJT due to []
a) FET is a voltage controlled device b) FET is temperature independent compared to BJT
c) FET has High Input Impedance d) All of the above
7. The phase difference between the output and input voltages of a CE amplifier is []
a) 180 b) 90 c) 0 d) 270
8. It is generally desired that a transistor should have _____ input impedance []
(a) Low (b) Very low (c) High (d) Very High
9. The input capacitor in an amplifier is the _____ capacitor []
(a) Coupling (b) Bypass (c) Leakage (d) None
10. The purpose of capacitors in a transistor amplifier is to _____ []
(a) protect the transistor (b) cool the transistor
(c) couple/bypass ac component (d) provide biasing
11. MOSFET is also called as _____
12. The cut in voltage of si transistor is _____
13. Draw the symbol of N channel JFET.
14. Draw the symbol of N channel E-MOSFET.
15. Draw BJT transistor small signal low frequency hybrid model.
16. FET as voltage variable resistor. (True/False) []
17. CD amplifier is source follower. (True/False) []
18. Millers theorem says that, if any impedance is available from output to input,
that can be divided to input and output. (True/False) []
19. For ac analysis, capacitors are short circuit and dc supply given to ground. (True/False) []
20. For small signal, h parameter model is used. (True/False) []

SVR ENGINEERING COLLEGE :: NANDYAL

II – Objective Examinations, February– 2022

Class : IV – B.Tech, I Semester
Subject : Microwave Engineering
Branch : ECE –A & B

Date : 01-02-2022 FN
Maximum Marks : 10 Marks
Time : 20 Minutes

Signature of the Invigilator:

Roll No:

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All Questions carrying equal marks

1. Which of the following is linear beam tube []
a) Reflex Klystron b) BWA c) BWO d) All
2. Which of the following is crossed field tube []
a) Magnetron b) Amplatron c) Carcinotron d) All
3. In the current controlled mode, which is multivalued []
a) Current density b) Voltage c) Power d) None
4. The concept of RWH theory is based on []
a) NDR b) NTR c) BWO d) None
5. The Travelling wave tube is _____ []
a) Oscillator b) Tuned amplifier c) wide band amplifier d) Both amplifier & Oscillator
6. For which of the following reason, the Varactor diode is not useful at microwave frequencies []
a) For electronic tuning b) For frequency multiplication c) As an Oscillator d) As a parametric amplifier
7. Theoretical efficiency of Two cavity Klystron is _____ []
a) 30% b) 40% c) 58% d) 50%
8. Which of the following is a broad band device []
a) 2 cavity klystron b) Reflex klystron c) TWT d) All of the above
9. _____ are utilized to retard the RF field []
a) TWT b) SWS c) a or b d) None
10. Backward wave exists in which of the following tube []
a) Helix TWT b) Magnetron c) Klystron d) None
11. IMPATT stands for _____.
12. TRAPATT stands for _____.
13. TED abbreviated as _____.
14. PIN diode is suitable for use as a _____.
15. Expression for Hull cutoff voltage in cylindrical Magnetron is _____.
16. To prevent oscillations an attenuator used in a TWT (TRUE/FALSE) []
17. Double minimum method is used to measure the high VSWR (TRUE/FALSE) []
18. Attenuation is the ratio of o/p power to i/p power (TRUE/FALSE) []
19. Transmission line is a lumped parameter network. (TRUE/FALSE) []
20. Bolometer technique is used to measure the low power. (TRUE/FALSE) []

SVR ENGINEERING COLLEGE:: NANDYAL

Year: II	Semester: 1	Program: B.Tech-ECE	MID: I	Total Marks :10
Course Name: : Signals & Systems		Course Code: 20A04301T		Date: 31-01-2022(AN) Time: 20 Minutes
Signature of the Invigilator:		Roll. No		

I. Choose the correct answers

- If two signals are orthogonal the coefficient of approximation is. []
A) 0 B) 1 C) ∞ D) None
- $\delta(t) = 1$ at ----- []
A) $t=1$ B) $t=0$ C) $t > 0$ D) $t < 0$
- $u(t)=1$ at ----- []
A) $t=1$ B) $t \geq 0$ C) $t < 0$ D) None
- The shape of exponential signal if $\alpha=0$ _____. []
A) Rising B) DC Signal C) Decaying D) None
- Integral of unit step function is----- []
A) Ramp signal B) Parabola signal C) Impulse signal D) Step function
- Double derivative of Ramp signal is _____. []
A) Unit Impulse signal B) Parabola signal C) both A& B D) Unit Ramp signal
- Output of the system depends on present and past inputs is called ----- []
A) Non causal B) Dynamic C) Static D) Variant
- If $T=2\pi$ the fundamental frequency is _____. []
A) 1 B) 0 C) π D) 2π
- $x(t)=2t$ over the interval 1 to 2 find F_0 []
A) 1 B) 2 C) 3 D) 4
- $x(t)=2$ over the interval 1 to 2 find A_0 []
A) 1 B) 2 C) 3 D) 4

II. Fill in the blanks

- Find the value of T in $x(t)=4 \text{ rect}(4t)$ _____.
- Write the relationship between unit step & signum function _____.
- Write the formula for Trigonometric Fourier series _____.
- Sketch the signal for $x(t)=r(-t+2)$ _____
- Signal can be defined at particular instant only is called _____.

III. State whether the statement is TRUE /FALSE

- Unit step function is energy signal. [TRUE /FALSE]
- Power of energy signal is zero. [TRUE /FALSE]
- Power signal + Energy signal = Power signal [TRUE /FALSE]
- Trigonometric Fourier series contain both cosine and sine terms [TRUE /FALSE]
- The function must have infinite number of maxima and minima. [TRUE /FALSE]

SVE ENGINEERING COLLEGE,NANDYAL

DEPARTMENT OF ELECTRONICS&COMMUNICATION ENGINEERING

Subject: communication systems

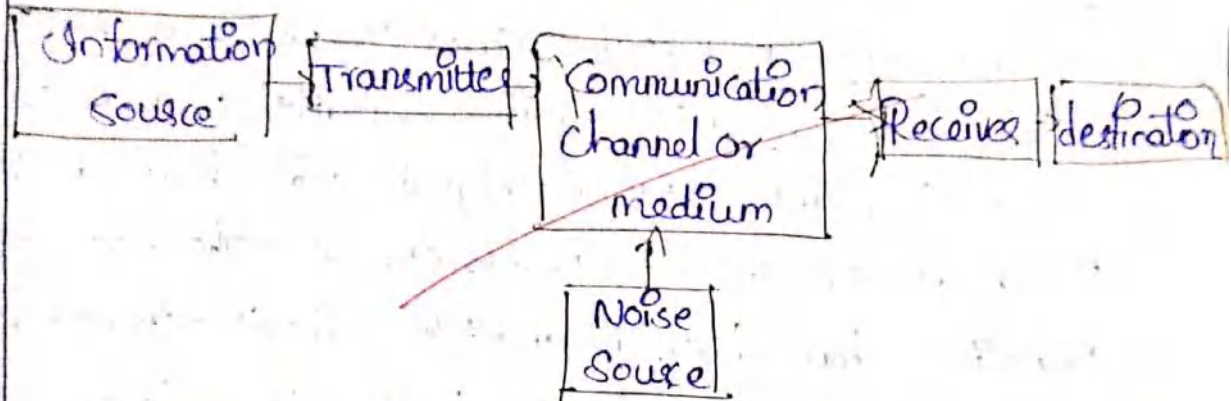
Assignment I questions

1. Explain the block diagram of general communication system
- 2.what is modulation? Explain the need for modulation in communication systems.
3. Explain the generation and demodulation of AM with neat sketch?
4. Explain the generation and demodulation of DSB-SC with neat sketch?
- 5.Write short note on the following
 - a) Base band and Pass band signals
 - b)Analog versus Digital communication

Assignment-1

17 With neat sketch explain the block diagram of general communication system.

Any electronic communication system can be represented in its basic form



Block diagram of communication system.

The basic components of communication systems are transmitter, a communication channel or medium, and a receiver. Noise is inherently present in the channel or medium. It gets added to the information being communicated.

The elements of communication system are follows.

- Information
- Transmitter
- communication channel or medium
- Noise
- Receiver

Information: The communication systems communicate messages. The message comes from the information sources. The ideas emanating from the human brain and changes in any physical environment. It may contain human, wire picture, code, data,

music and their combinations. The amount of information contained in any given message is measured in bits or dits.

Transmitters:-

The transmitter is a collection of electronic circuits designed to convert the information into a signal suitable for transmission. Such messages need to be coded or processed before transmission and also require suitable transducers to convert them into electrical signals. The built-in circuitry such as decoders, encoders, transducers, etc. The most of the transmitters have built-in amplifier circuits. These circuits amplify the incoming signals before transmission.

Communication channel

The communication channel is the medium by which the electronic signal is transmitted from one place to another. The communication medium can be a pair of conducting wire, coaxial cable, optical fibre cable or free space.

- Wire communication or line communication.
- Wireless communication or Radio communication.

Noise

Noise is random, undesirable electric energy that disturbs the communication system via the medium and interferes with the transmitted message. Some noise is also produced in the receiver. Noise can be either natural or man made. It cannot be completely eliminated. However, there are ways to deal with noise and reduce the possibility of degradation.

of signal due to noise.

Receiver

A receiver is a collection of electronic circuits designed to convert the signal back to the original information. It consists of amplifiers, detector, mixer, oscillator, transducer and so on.

2) What is modulation? Explain the need for modulation in communication system?

Need for modulation:-

We have seen that baseband signals are incompatible for direct transmission over the medium and therefore we have to use modulation technique for the communication of baseband signal.

- Reduces the height of antenna.
- Avoids mixing of signals.
- Increases the range of communication.
- Allows multiplexing of signals.
- Allows adjustments in the bandwidth.
- Improves quality of reception.
- Reduces the height of antenna:-

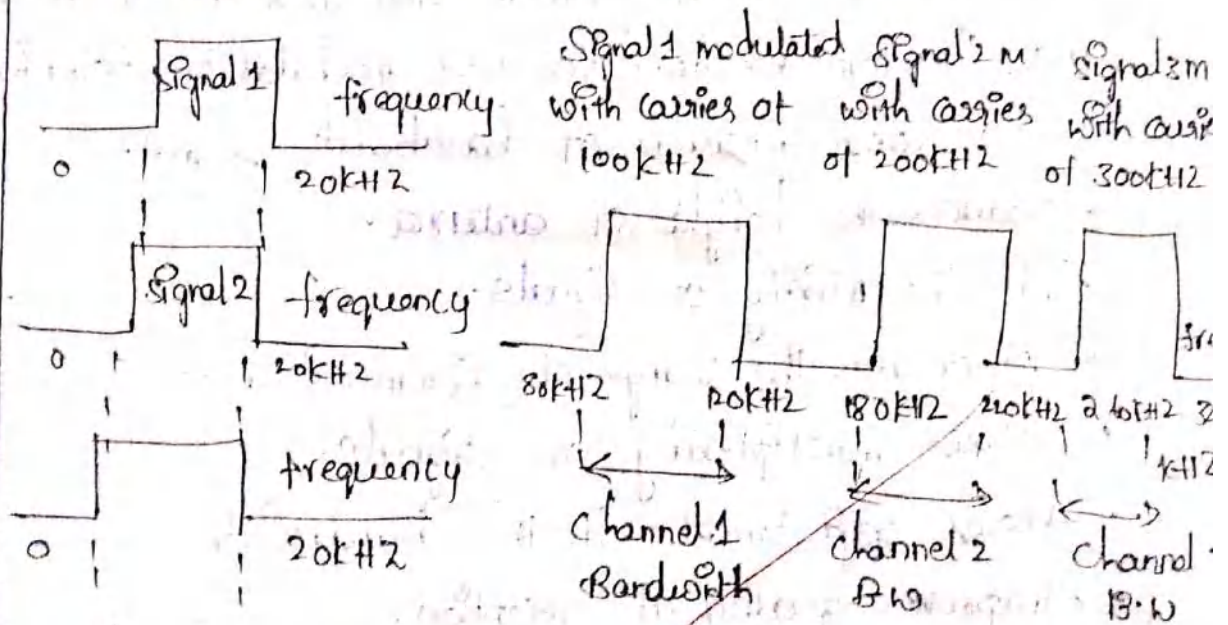
The height of the antenna required for transmission and reception of radio waves in radio transmission is a function of wavelength of the frequency used. The minimum height of the antenna is given as $\lambda/4$. The wavelength λ is given as

$$\lambda = c/f$$

2. Avoids mixing of signals:-

All sound signals are concentrated within the range from 20 kHz to 20 kHz. The transmission of baseband signals from various sources causes the mixing of signal and then it is difficult to separate at the receiver end.

In order to separate the various signals it is necessary to translate them all to different portions of the electromagnetic spectrum; each must be given its own bandwidth, commonly known as channel bandwidth.



3. Increases the range of communication

At low frequencies radiation is poor and signal gets highly attenuated. Therefore baseband signals cannot be transmitted directly over long distance. Modulation effectively increases the frequency of the signal to be radiated and thus increases the distance over which signals can be transmitted faithfully.

4. Allows multiplexing of signals:-

The modulation permits multiplexing to be used. Multiplexing means transmission of two or more signals simultaneously over the same channel.

The different signals from different stations can be separated in the receiver since the carrier frequencies for these signals are different. It is commonly known as tuning the receiver to the desired station.

5. Allows adjustments in the bandwidth:-

Bandwidth of a modulated signal may be made smaller or larger than the original signal. Signal to noise ratio in the receiver which is a function of the signal bandwidth can thus be improved by proper control of the bandwidth at the modulating stage.

6. Improves quality of reception:-

The signal communication using modulation techniques such as frequency modulation, pulse code modulation reduce the effect of noise to great extent. Reduction in noise improves the quality of reception.

3) Explain the generation and demodulation of amplitude modulation with neat sketches.

Amplitude modulation:-

In amplitude modulation, the amplitude of a carrier signal is varied by the modulating signal. Here, information signal is the modulating signal and high frequency signal which is being modulated is the carrier signal.

formally, AM is defined as system of modulation in which the instantaneous value of the carrier amplitude changes in accordance with the amplitude of the modulating signal

1) Undermodulation $\mu < 1$

2) 100% modulation $\mu = 1$

3) Over modulation $\mu > 1$

$$\mu = \frac{A_m}{A_c} \rightarrow \text{①}$$

$$\boxed{\mu = k_a A_m}$$

under modulated AM wave

$$\begin{aligned} S(t) &= A_c (1 + k_a m(t)) \cos 2\pi f_c t \\ &= A_c \cos 2\pi f_c t + A_c k_a A_m \cos 2\pi f_m t \cos 2\pi f_c t \\ &= A_c \cos 2\pi f_c t + \mu A_c \cos 2\pi f_m t \cos 2\pi f_c t \end{aligned}$$

$$\mu = \frac{A_m}{A_c}$$

$$A_c (1 + \mu) = A_{\max}$$

$$A_c (1 - \mu) = A_{\min}$$

$$\frac{A_{\max}}{A_{\min}} \rightarrow \frac{A_c (1 + \mu)}{A_c (1 - \mu)}$$

$$A_{\max} (1 - \mu) = A_{\min} (1 + \mu)$$

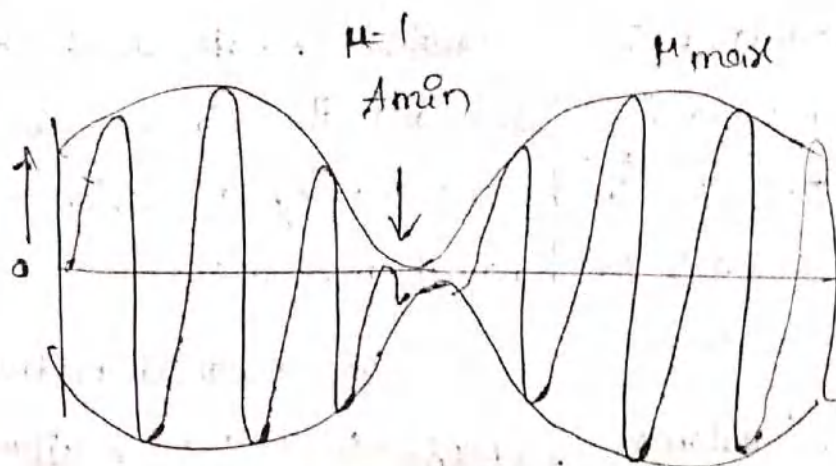
$$A_{\max} - \mu A_{\max} = A_{\min} + \mu A_{\min}$$

$$A_{\max} - A_{\min} = \mu (A_{\max} + A_{\min})$$

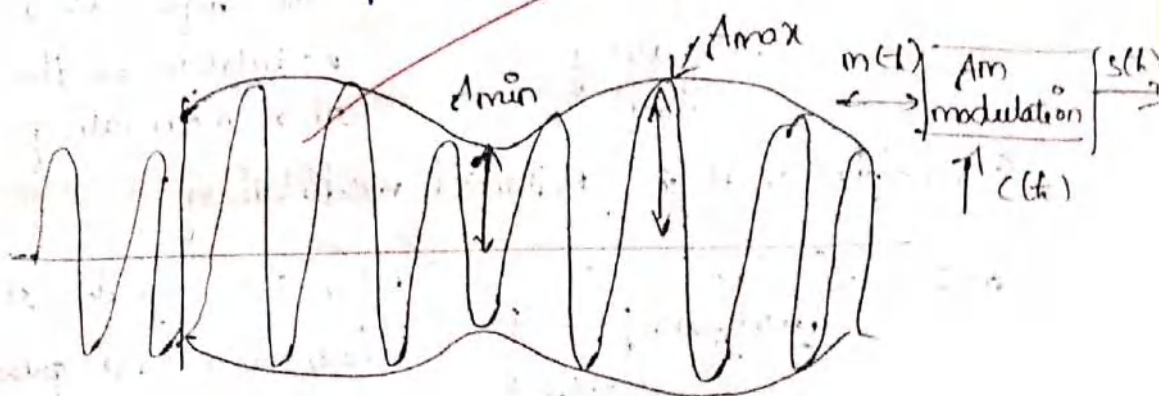
$$\mu = \frac{A_{max} - A_{min}}{A_{max} + A_{min}}$$

$$A_{max} + A_{min}$$

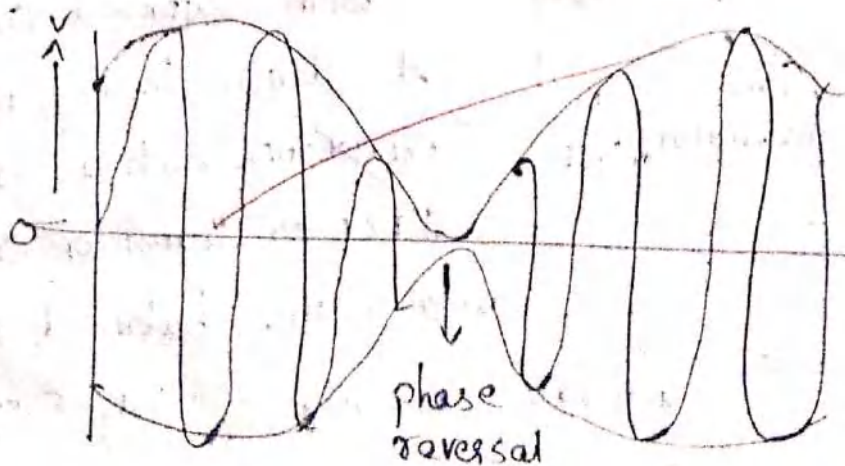
In perfect modulation A_{min} will becomes



for perfect modulation



over modulation $\rightarrow$ It crosses the 0 line.



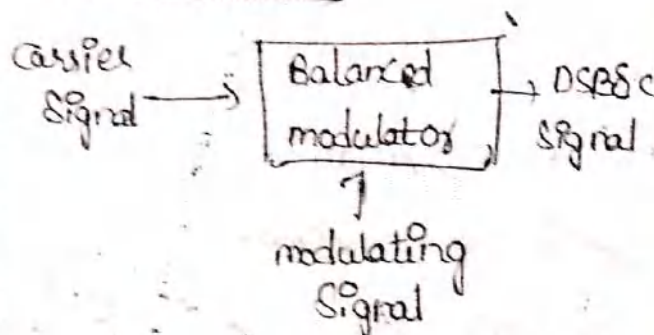
- $\rightarrow$ Amplitude of message signal is greater than carrier signal
- $\rightarrow$ The Drawback some of information will less.

4) Explain the generation and demodulation of DSB-SC with neat sketches

4) Generation of DSB-SC:-

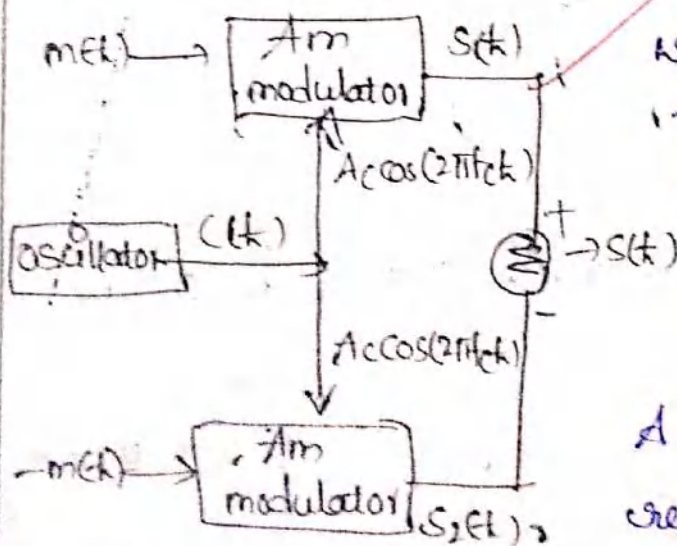
We have seen that a double sideband suppressed carrier modulated wave consists of the product of the modulating signal and the carrier wave. The desired product can be achieved by a device called a product modulator or balanced modulator.

Balanced modulator



The balanced modulator circuit is used to suppress the carrier from the AM signal. The inputs to a balanced modulator are the carrier and a modulating signal.

Principle used in balanced modulation



When two signals at different frequencies are passed through a nonlinear resistance, the AM signal is generated with suppressed carrier.

A device having non-linear resistance such as diode, JFET or transistor can be used in the balanced modulator

to generate AM signal with suppressed carrier.

$$s(t) = m(t) \cos(2\pi f_c t)$$

$$s(t) = \frac{A_c}{2} [m(f-f_c) + m(f+f_c)]$$

$$S(f) = A_c \cos 2\pi f_c t \quad A_m \cos 2\pi f_m t$$

$$S(f) = \frac{A_c A_m}{2} [\cos 2\pi (f_c + f_m) t + \cos 2\pi (f_c - f_m) t]$$

$$A_c \cos 2\pi f_c t \xrightarrow{f \cdot t} \frac{A_c}{2} [s(f-f_c) + s(f+f_c)]$$

$$S(f) = \frac{A_c A_m}{4} [s(f - (f_c + f_m)) + s(f + (f_c + f_m)) + \frac{A_c A_m}{4} [s(f - (f_c - f_m)) + s(f + (f_c - f_m))]$$

$$f_c + f_m \rightarrow f_c + f_m$$

$$f_c - f_m$$

$$-f_c + f_m \rightarrow -f_c + f_m$$

$$-f_c - f_m$$

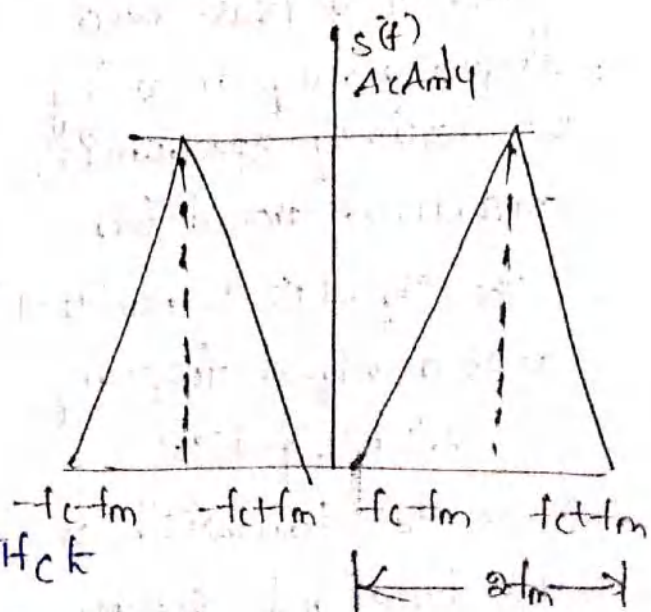
Spectrum of DSB-SC:-

$$B.W = USB - LSB$$

$$(f_c + f_m) - (f_c - f_m)$$

$$f_c + f_m - f_c + f_m$$

$$2f_m$$



$$S_1(t) = A_c (1 + k_a m(t)) \cos 2\pi f_c t$$

$$S_2(t) = A_c (1 - k_a m(t)) \cos 2\pi f_c t$$

$$DSB-SC = S_1(t) - S_2(t)$$

$$A_c \cos 2\pi f_c t + A_c k_a m(t) \cos 2\pi f_c t - A_c \cos 2\pi f_c t + A_c k_a m(t) \cos 2\pi f_c t$$

$$= 2A_c K_a \cos(2\pi f_c t) m(t)$$

$$= 8K_a A_c \cos(2\pi f_c t) m(t)$$

⑤ Write short notes on

- Base band and pass band signal.
- Analog versus Digital communications.
- Base band and pass band signal

Base band	pass band.
* Base band refers to the original transmission signal generated from the message source with no modulation of high frequency carrier. → Base band signal is a signal in a near-zero frequency range meaning the frequency spectrum is concentrated around $f=0$. → The signal is transmitted over a signal frequency as discrete pulses. → The full bandwidth of the baseband system carries only one data signal at a time. → <u>Ex:-</u> Ethernet protocol, landline cables, network cables etc.,	* passband refers to filtered signal in which the frequency or phase of the carrier signal is modulated to transmit the bits. → passband signal has its frequency spectrum concentrated around the carrier frequency (f_c). → The transmission requires multiplexing several signals simultaneously. → The system can carry multiple signals simultaneously. → A radio receives is the best example of a passband transmission.

b) Analog versus digital Communication.

Analog Communication

→ Transmitted modulated signal is analog in nature.

* Amplitude, frequency or phase variations in the transmitted signal represent the information or message.

→ Noise immunity is poor for AM, but improved for FM and PM.

→ It is not possible to separate out noise and signal. Therefore, repeaters cannot be used.

→ Coding is not possible.

→ FDM is used for multiplexing.

→ Analog modulation systems are AM, FM, PM, PAM, AWM, etc.

Digital Communication

→ Transmitted signal is digital i.e. train of digital pulses.

* Amplitude, width or position of the transmitted pulses is constant. The message is transmitted in the form of code words.

→ Noise immunity is excellent.

→ It is possible to separate signal from noise. Therefore, repeaters can be used.

→ Coding techniques can be used to detect and correct the errors.

→ TDM is used for multiplexing.

→ Digital modulation systems are PCM, DM, AOM, DPCM, etc.

(5)

15/6/22

A
Project Report
on

WOMEN SAFETY NIGHT PATROLLING IOT ROBOT

Submitted in the partial fulfillment of the requirement for the award of

Bachelor of Technology
in

Electronics and Communication Engineering

By

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Under the esteemed guidance of

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

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(Affiliated to JNTUA Anantapur, Approved by AICTE, New Delhi)

2017-21

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the dissertation entitled “**WOMEN SAFETY NIGHT PATROLLING IOT ROBOT**” is the bonafide work done and submitted by

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towards the partial fulfillment of the requirement for the award of the degree of **Bachelor of Technology** in **Electronics and Communication Engineering** in the **SVR ENGINEERING COLLEGE(Affiliated to Jawaharlal Nehru Technological University Anantapur)** is a record of bonafide work carried out by his under our guidance and supervision.

The results embodied in this dissertation have not been submitted to any other university or institute for the award of any degree.

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EXTERNAL EXAMINER

DECLARATION

We hereby declare that the project report entitled “**WOMEN SAFETY NIGHT PATROLLING IOT ROBOT**” is carried out by us during the academic year 2020–2021 in partial fulfillment of the award of Bachelor of Technology in Electronics and communication Engineering from SVR Engineering College affiliated to Jawaharlal Nehru Technological University Anantapur . We have not submitted the same to any other university or organization for the award of any other degree.

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Vision And Mission of the institute

Vision

To produce Competent Engineering Graduates with a strong base Technical Knowledge and the Complementary skills needed to be successful Professional Engineers.

Mission

To fulfill the vision by imparting Quality Technical Education to the Aspiring Students, by creating Effective Teaching/Learning Environment and providing State-of –Art infrastructure and Resources.

Vision And Mission of the Department

Vision

The Department of ECE aspires to be a hub of academic and research excellence through an effective teaching and research with values and ethics to meet societal needs

Mission

To provide high quality education in the field of electronics and communication engineering through highly qualified and well experienced staff.

- To instill a scientific mindset along with logical thinking in students and expose them to advanced technologies in Electronics and Communication Engineering to grab the opportunities in the industry.
- To enhance the employability skills of the students through continuous training with the support of college CDC.
- To enable them imbibe human values, professional ethics, self-learning, and team spirit among the students

Program Educational Objectives (PEO's)

The students in Electronics and communication engineering will be able to

- Excel in professional career and higher education in Electronics and Communication Engineering and related fields.
- Solve real life problems related to the domain for betterment of the society
- Inculcate professional and ethical attitude, team spirit, leadership qualities and effective communication skills

Program Specific Outcomes (PSO's)

The students in Electronics and communication engineering will be able to

- Analyze and implement applications in the field of communications, Embedded systems and VLSI design
- Identify indigenous processes and components for producing high quality, compact, energy efficient and eco-friendly solutions at affordable prices.

SVR ENGINEERING COLLEGE															
DEPARTMENT		ELECTRONICS AND COMMUNICATION ENGINEERING													
PROGRAM OUTCOME ATTAINMENT															
PO 1	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex Engineering problems.														
PO 2	Identify, formulate, review research literature, and analyze Complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.														
PO 3	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety , and the cultural, societal , and environmental considerations.														
PO 4	Ability to review research literature, use research methods to execute project and synthesize the problem to provide valid conclusions.														
PO 5	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.														
PO 6	Apply reasoning informed by the contextual Knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.														
PO 7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and Demonstrate the knowledge of, and need for sustainable development.														
PO 8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.														
PO 9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.														
PO 10	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.														
PO 11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.														
PO 12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.														
PSO 1	Analyze and implement applications in the field of communications, Embedded systems and VLSI design														
PSO 2	Identify indigenous processes and components for producing high quality, compact, energy efficient and ecofriendly solutions at affordable prices.														
TITLE		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
Women Safety Night Patrolling IOT ROBOT		2	2	3	2	2	3	2	2	1	2	2	1	2	2

ABSTRACT

In today's world, women safety has become a major issue in our country's issue in our country as women can't step out of their homes at any time, especially during night.. There is still a fear in alone areas for women as well as men. So here we propose a security patrolling robot using Raspberry PI. The system uses cameras and mic mounted on robotic vehicle for securing any premises.

The robotic vehicle moves at particular path and is equipped with camera and sound sensors. It uses a predefined line to follow its path while patrolling. It stops at particular points and moves to next points if sound is detected.

The system uses IR based path following system for patrolling assigned area. It monitors each area to detect any problem using combination of two HD cameras. It has the ability to monitor sound in the premises. Robot hears Any sound after area is quite and it starts moving towards the sound on its predefined path. It then scans the area using its camera to detect any human faces detected.

It captures and starts transmitting the images of the situation immediately to the IOT website. Here we use IOT gecko for receiving transmitted images and displaying them to user with alert sounds. Thus we put forward a fully autonomous security robot that operates tirelessly and patrols large areas on its own to secure the facility.

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WOMEN SAFETY NIGHT PATROLLING IOT ROBOT



CHAPTER 1

INTRODUCTION

Women are adept at mobilizing diverse groups for a common cause. They often work across ethnic, religious, political, and cultural divides to promote peace. We are all aware of importance of women's safety, but we must realize that they should be properly protected. Women are not as physically strong as men; in an emergency situation a helping hand would be a relief for them.

In today's world, women safety has become a major issue in our country's issue in our country as women can't step out of their homes at any time, especially during night.

The best way to minimize your chances of becoming a victim of violent crime (robbery, sexual assault, rape, domestic violence) is to identify and call on resources to help them out of dangerous situations. Whether it is an immediate trouble, or they get separated from friends during a night out and don't know how to get home, having these applications can reduce the risk and bring assistance when needed.

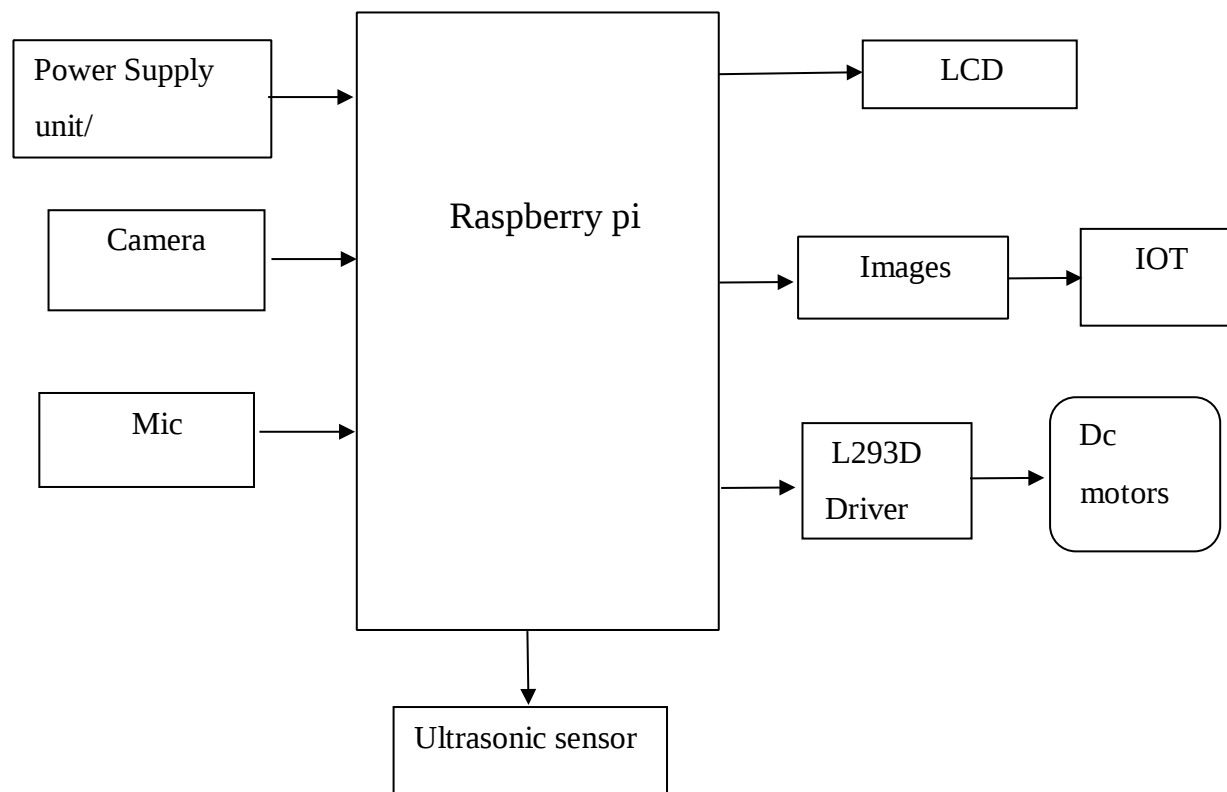
Although several were originally developed for students to reduce the risk of sexual assault on campus, they are suitable for all women in the light of recent outrage in Delhi which shook the nation and woke us to the safety issues for our daughters, people are gearing up in different ways to fight back.

The status of women in India has gone through many great changes over the past few millennia. In modern India, women continue to face social challenges and are often victims of abuse and violent crimes and, according to a global poll conducted by Thomson Reuters, India is the "fourth most dangerous country" in the world for women, and the worst country for women among the G20 countries.

This project focuses on a security robot that is designed solely to serve the purpose of providing security and safety to women so that they never feel helpless while facing such social challenges. The Delhi "Nirbhaya" case that triggered the whole nation was the greatest motivation for this project. It was high time women needed a change.

OBJECTIVE

Our aim of this project is to provide Security to the women. This system is designed to provide security to women as women safety and security is a crucial issue.

BLOCK DIAGRAM:**Fig :1.1 Block diagram of Robot**

As shown in the fig. the block representation, the system is designed around Raspberry pi. Here the sound sensor is used to sense the sound, the source of the sound being the victim. Raspberry pi is installed with the night vision camera which helps the system to go for automation and help to find the human or any problem detected using the sound sensor and according to the sound produced it automatically goes to that area and capture the image and send it to the user using IOT technology.

CHAPTER 2

EMBEDDED SYSTEMS

2.1 Embedded System

An embedded system is a system which is going to do a predefined specified task is the embedded system and is even defined as combination of both software and hardware. A general purpose definition of embedded systems is that they are devices used to control, monitor or assist the operation of equipment, machinery or plant. "**Embedded**" reflects the fact that they are an integral part of the system. At the other extreme a general-purpose computer may be used to control the operation of a large complex processing plant, and its presence will be obvious.

All embedded systems are including computers or microprocessors. Some of these computers are however very simple systems as compared with a personal computer. In more complex systems an application program that enables the embedded system to be used for a particular purpose in a specific application determines the functioning of the embedded system. The ability to have programs means that the same embedded system can be used for a variety of different purposes. In some cases, a microprocessor may be designed in such a way that application software for a particular purpose can be added to the basic software in a second process, after which it is not possible to make further changes. The applications software on such processors is sometimes referred to as firmware.

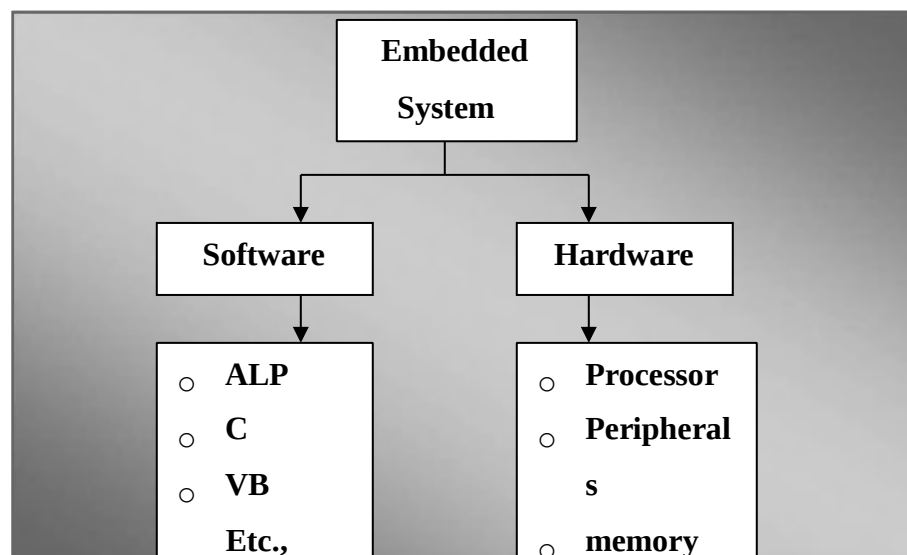


Figure 2.1 Block diagram of Embedded System



Software deals with the languages like ALP, C, and VB etc., and Hardware deals with Processors, Peripherals, and Memory.

Memory: It is used to store data or address.

Peripherals: These are the external devices connected

Processor: It is an IC which is used to perform some task **Applications of embedded systems**

- Manufacturing and process control
- Construction industry
- Transport
- Buildings and premises
- Domestic service
- Communications
- Office systems and mobile equipment
- Banking, finance and commercial
- Medical diagnostics, monitoring and life support
- Testing, monitoring and diagnostic systems **Processors are classified into**

four types like:

- Micro Processor (μp)
- Micro controller (μc)
- Digital Signal Processor (DSP)
- Application Specific Integrated Circuits (ASIC) **Micro Processor (μp):**

A silicon chip that contains a CPU. In the world of personal computers, the terms microprocessor and CPU are used interchangeably. At the heart of all personal computers and most workstations sits a microprocessor. Microprocessors also control the logic of almost all digital devices, from clock radios to fuel-injection systems for automobiles.

Three basic characteristics differentiate microprocessors:

- **Instruction set:** The set of instructions that the microprocessor can execute.
- **Bandwidth :** The number of bits processed in a single instruction.
- **Clock speed :** Given in megahertz (MHz), the clock speed determines how many instructions per second the processor can execute.

In both cases, the higher the value, the more powerful the CPU. For example, a 32-bit microprocessor that runs at 50MHz is more powerful than a 16-bit microprocessor that runs at 25MHz. In addition to bandwidth and clock speed, microprocessors are classified as being either RISC (reduced instruction set computer) or CISC (complex instruction set computer).

A microprocessor has three basic elements, as shown above. The ALU performs all arithmetic computations, such as addition, subtraction and logic operations (AND, OR, etc.). It is controlled by the Control Unit and receives its data from the Register Array. The Register Array is a set of registers used for storing data. These registers can be accessed by the ALU very quickly. Some registers have specific functions - we will deal with these later. The Control Unit controls the entire process. It provides the timing and a control signal for getting data into and out of the registers and the ALU and it synchronizes the execution of instructions (we will deal with instruction execution at a later date).

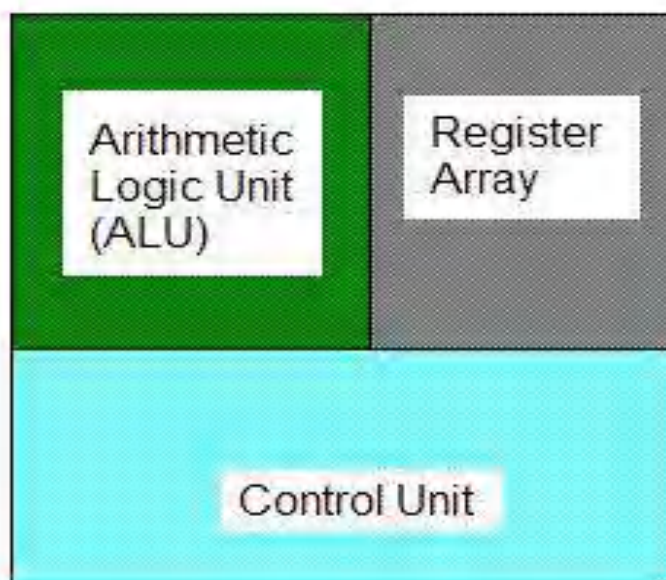


Fig 2.1.1: Three Basic Elements of a Microprocessor

Controller (μ c):

A microcontroller is a small computer on a single integrated circuit containing a processor core, memory, and programmable input/output peripherals. Program memory in the form of NOR flash or OTP ROM is also often included on chip, as well as a typically small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications.

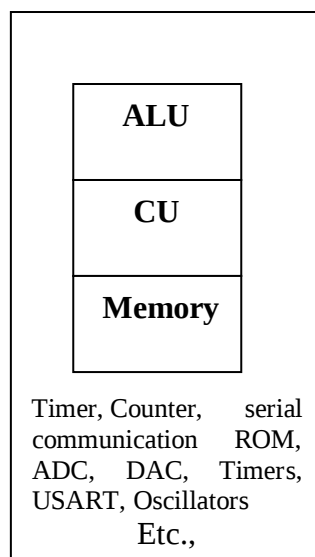


Figure 2.2 Block Diagram of Micro Controller (μ c)

Digital Signal Processors (DSPs):

Digital Signal Processors is one which performs scientific and mathematical operation. Digital Signal Processor chips - specialized microprocessors with architectures designed specifically for the types of operations required in digital signal processing. Like a general-purpose microprocessor, a DSP is a programmable device, with its own native instruction code. DSP chips are capable of carrying out millions of floating-point operations per second, and like their betterknown general-purpose cousins, faster and more powerful versions are continually being introduced. DSPs can also be embedded within complex "system-on-chip" devices, often containing both analog and digital circuitry.

Application Specific Integrated Circuit (ASIC)

ASIC is a combination of digital and analog circuits packed into an IC to achieve the desired control/computation function.

ASIC typically contains

- CPU cores for computation and control.
- Peripherals to control timing critical functions.
- Memories to store data and program.
- Analog circuits to provide clocks and interface to the real world which is analog in nature.
- I/O s to connect to external components like LEDs, memories, monitors etc.

2.2 Computer Instruction Set



There are two different types of computer instruction set there are:

1. RISC (Reduced Instruction Set Computer) and
2. CISC (Complex Instruction Set computer)

2.2.1 Reduced Instruction Set Computer (RISC)

A RISC (reduced instruction set computer) is a microprocessor that is designed to perform a smaller number of types of computer instruction so that it can operate at a higher speed (perform more million instructions per second, or millions of instructions per second). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

Besides performance improvement, some advantages of RISC and related design improvements are:

- A new microprocessor can be developed and tested more quickly if one of its aims is to be less complicated.
- Operating system and application programmers who use the microprocessor's instructions will find it easier to develop code with a smaller instruction set.
- The simplicity of RISC allows more freedom to choose how to use the space on a microprocessor.

Higher-level language compilers produce more efficient code than formerly because they have always tended to use the smaller set of instructions to be found in a RISC computer.

2.2.2 RISC characteristics

➤ **Simple instruction set:**

In a RISC machine, the instruction set contains simple, basic instructions, from which more complex instructions can be composed.

➤ **Same length instructions.**

Each instruction is the same length, so that it may be fetched in a single operation.

➤ **1 machine-cycle instructions.**

Most instructions complete in one machine cycle, which allows the processor to handle several instructions at the same time. This pipelining is a key technique used to speed up RISC machines.



2.2.3 Complex Instruction Set Computer (CISC)

CISC, which stands for **Complex Instruction Set Computer**, is a philosophy for designing chips that are easy to program and which make efficient use of memory. Each instruction in a CISC instruction set might perform a series of operations inside the processor. This reduces the number of instructions required to implement a given program and allows the programmer to learn a small but flexible set of instructions.

The advantages of CISC

At the time of their initial development, CISC machines used available technologies to optimize computer performance.

- Microprogramming is as easy as assembly language to implement, and much less expensive than hardwiring a control unit.
- The ease of micro-coding new instructions allowed designers to make CISC machines upwardly compatible: a new computer could run the same programs as earlier computers because the new computer would contain a superset of the instructions of the earlier computers. ➤ As each instruction became more capable, fewer instructions could be used to implement a given task. This made more efficient use of the relatively slow main memory.
- Because micro program instruction sets can be written to match the constructs of high-level languages, the compiler does not have to be as complicated.

The disadvantages of CISC

Still, designers soon realized that the CISC philosophy had its own problems, including: ➤ Earlier generations of a processor family generally were contained as a subset in every new version --- so instruction set & chip hardware become more complex with each generation of computers.

- So that as many instructions as possible could be stored in memory with the least possible wasted space, individual instructions could be of almost any length---this means that different instructions will take different amounts of clock time to execute, slowing down the overall performance of the machine.
- Many specialized instructions aren't used frequently enough to justify their existence --- approximately 20% of the available instructions are used in a typical program.

➤ CISC instructions typically set the condition codes as a side effect of the instruction. Not only does setting the condition codes take time, but programmers have to remember to examine the condition code bits before a subsequent instruction changes them.

2.3 Memory Architecture

There two different type's memory architectures there are:

- Harvard Architecture
- Von-Neumann Architecture

2.3.1 Harvard Architecture

Computers have separate memory areas for program instructions and data. There are two or more internal data buses, which allow simultaneous access to both instructions and data. The CPU fetches program instructions on the program memory bus.

The **Harvard architecture** is a computer architecture with physically separate storage and signal pathways for instructions and data. The term originated from the Harvard Mark I relaybased computer, which stored instructions on punched tape (24 bits wide) and data in electromechanical counters. These early machines had limited data storage, entirely contained within the central processing unit, and provided no access to the instruction storage as data. Programs needed to be loaded by an operator, the processor could not boot itself.

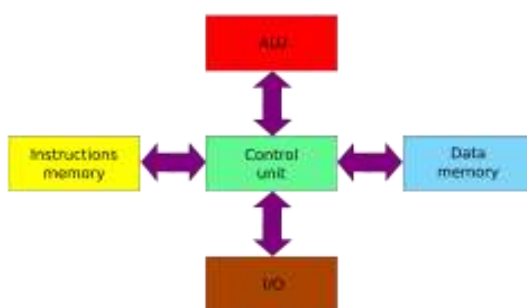


Figure 2.3 Harvard Architecture

Modern uses of the Harvard architecture:

The principal advantage of the pure Harvard architecture - simultaneous access to more than one memory system - has been reduced by modified Harvard processors using modern CPU cache systems. Relatively pure Harvard architecture machines are used mostly in applications where



tradeoffs, such as the cost and power savings from omitting caches, outweigh the programming penalties from having distinct code and data address spaces.

- Digital signal processors (DSPs) generally execute small, highly optimized audio or video processing algorithms. They avoid caches because their behavior must be extremely reproducible. The difficulties of coping with multiple address spaces are of secondary concern to speed of execution. As a result, some DSPs have multiple data memories in distinct address spaces to facilitate SIMD and VLIW processing. Texas Instruments TMS320 C55x processors, as one example, have multiple parallel data busses (two write, three read) and one instruction bus.
- Microcontrollers are characterized by having small amounts of program (flash memory) and data (SRAM) memory, with no cache, and take advantage of the Harvard architecture to speed processing by concurrent instruction and data access. The separate storage means the program and data memories can have different bit depths, for example using 16-bit wide instructions and 8-bit wide data. They also mean that instruction pre-fetch can be performed in parallel with other activities. Examples include, the AVR by Atmel Corp, the PIC by Microchip Technology, Inc. and the ARM Cortex-M3 processor (not all ARM chips have Harvard architecture).

Even in these cases, it is common to have special instructions to access program memory as data for read-only tables, or for reprogramming.

2.3.2 Von-Neumann Architecture

A computer has a single, common memory space in which both program instructions and data are stored. There is a single internal data bus that fetches both instructions and data. The **Von Neumann Architecture** is a design model for a stored-program digital computer that uses a central processing unit (CPU) and a single separate storage structure ("memory") to hold both instructions and data. It is named after the mathematician and early computer scientist John von Neumann. Such computers implement a universal Turing machine and have a sequential architecture.

A **Stored-Program** digital computer is one that keeps its programmed instructions, as well as its data, in read-write, random-access memory (RAM). Stored-program computers were advancement over the program-controlled computers of the 1940s, such as the Colossus and the ENIAC, which were programmed by setting switches and inserting patch leads to route data and to control signals between various functional units.

In the vast majority of modern computers, the same memory is used for both data and program instructions. The mechanisms for transferring the data and instructions between the CPU and memory are, however, considerably more complex than the original von Neumann architecture.

The terms "Von Neumann Architecture" and "Stored-Program Computer" are generally used interchangeably, and that usage is followed in this article.

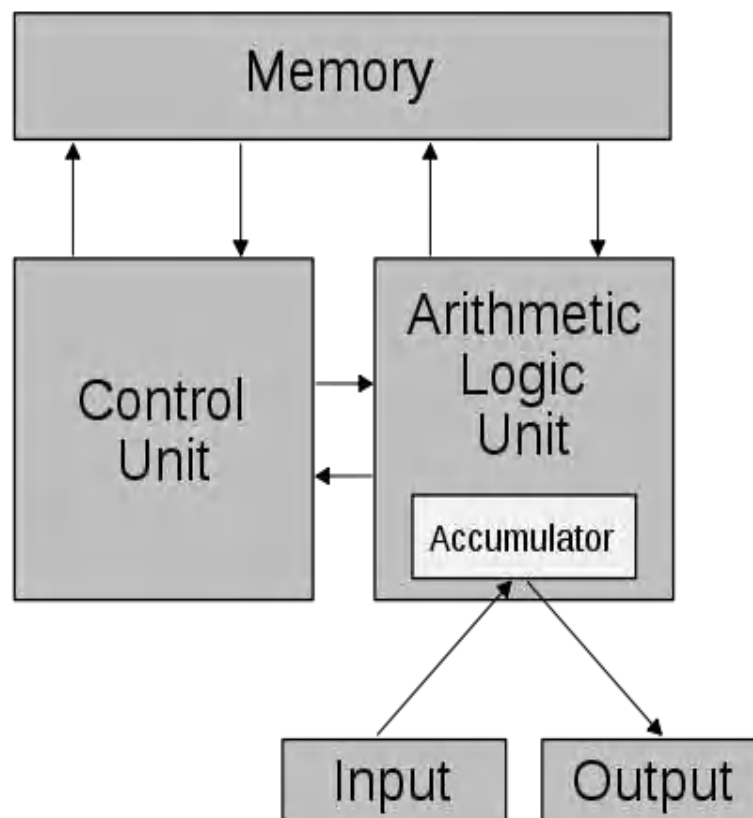


Figure 2.4 Schematic of the Von-Neumann Architecture.

Basic Difference between Harvard and Von-Neumann Architecture

- The primary difference between Harvard architecture and the Von Neumann architecture is in the Von Neumann architecture data and programs are stored in the same memory and managed by the same information handling system.
- Whereas the Harvard architecture stores data and programs in separate memory devices, and they are handled by different subsystems.
- In a computer using the Von-Neumann architecture without cache; the central processing unit (CPU) can either be reading and instruction or writing/reading data to/from the memory. Both



of these operations cannot occur simultaneously as the data and instructions use the same system bus.

- In a computer using the Harvard architecture the CPU can both read an instruction and access data memory at the same time without cache. This means that a computer with Harvard architecture can potentially be faster for a given circuit complexity because data access and instruction fetches do not contend for use of a single memory pathway.
- Today, the vast majority of computers are designed and built using the Von Neumann architecture template primarily because of the dynamic capabilities and efficiencies gained in designing, implementing, operating one memory system as opposed to two.
- Von Neumann architecture may be somewhat slower than the contrasting Harvard Architecture for certain specific tasks, but it is much more flexible and allows for many concepts unavailable to Harvard architecture such as self-programming, word processing and so on.

CHAPTER 3

POWER SUPPLY

POWER SUPPLY:

The purpose of a power supply is to convert the power delivered to its input by the sinusoidally alternating mains electricity supply into power available at its output in the form of a smooth and constant direct voltage. This is usually achieved in a number of stages as illustrated in Figure 3.1. In conventional power supplies, the 50 or 60 Hz mains is connected directly to the transformer inputs. In the more modern switch mode ones, the a.c. input shown in Figure 3.1 will be at a frequency of 50 kHz.

3.1 Block Diagram

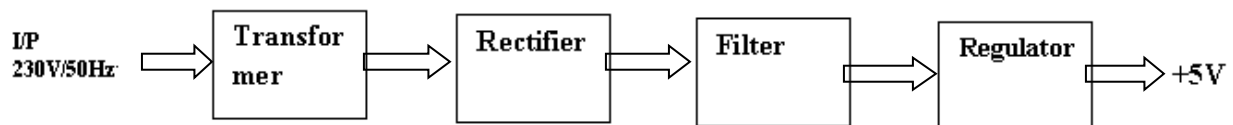


Figure 3.1 Power Supply

Description

3.2.1 Transformer

A **transformer** is a device that transfers electrical energy from one circuit to another through inductively coupled conductors—the transformer's coils. A varying current in the first or *primary* winding creates a varying magnetic flux in the transformer's core, and thus a varying magnetic field through the *secondary* winding. This varying magnetic field induces a varying electromotive force (EMF) or "voltage" in the secondary winding. This effect is called mutual induction.



Figure 3.1.1: Transformer Symbol

Transformer is a device that converts the one form energy to another form of energy like a transducer.

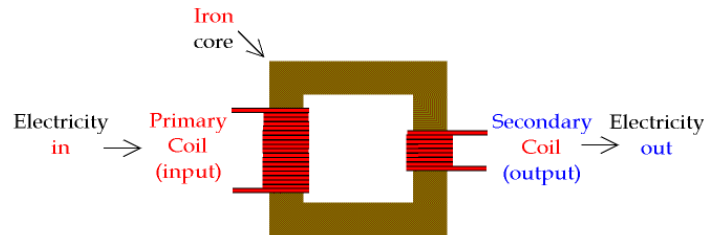


Figure 3.2 Transformer *Basic*

Principle:

A transformer makes use of Faraday's law and the ferromagnetic properties of an iron core to efficiently raise or lower AC voltages. It of course cannot increase power so that if the voltage is raised, the current is proportionally lowered and vice versa.

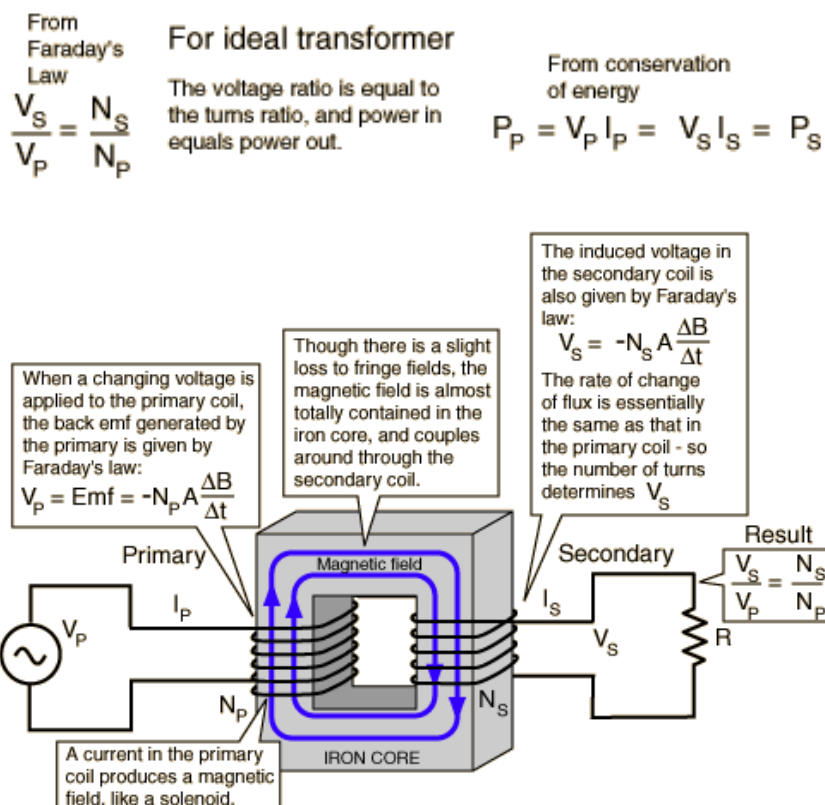


Figure 3.2.1: Basic Principle

Transformer Working

A transformer consists of two coils (often called 'windings') linked by an iron core, as shown in figure below. There is no electrical connection between the coils, instead they are linked by a magnetic field created in the core.

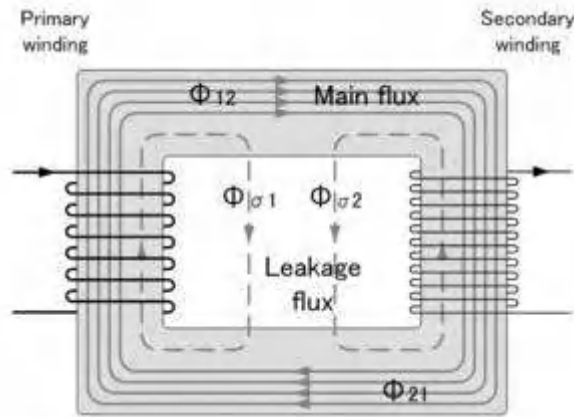


Figure 3.2.2: Basics of Transformer working

Transformers are used to convert electricity from one voltage to another with minimal loss of power. They only work with AC (alternating current) because they require a changing magnetic field to be created in their core. Transformers can increase voltage (step-up) as well as reduce voltage (step-down).

Alternating current flowing in the primary (input) coil creates a continually changing magnetic field in the iron core. This field also passes through the secondary (output) coil and the changing strength of the magnetic field induces an alternating voltage in the secondary coil. If the secondary coil is connected to a load the induced voltage will make an induced current flow. The correct term for the induced voltage is 'induced electromotive force' which is usually abbreviated to induced e.m.f.

The iron core is laminated to prevent 'eddy currents' flowing in the core. These are currents produced by the alternating magnetic field inducing a small voltage in the core, just like that induced in the secondary coil. Eddy currents waste power by needlessly heating up the core but they are reduced to a negligible amount by laminating the iron because this increases the electrical resistance of the core without affecting its magnetic properties.

Transformers have two great advantages over other methods of changing voltage:

1. They provide total electrical isolation between the input and output, so they can be safely used to reduce the high voltage of the mains supply.

2. Almost no power is wasted in a transformer. They have a high efficiency (power out / power in) of 95% or more.

Classification of Transformer:

- Step-Up Transformer
- Step-Down Transformer **Step-Down Transformer:**

Step down transformers are designed to reduce electrical voltage. Their primary voltage is greater than their secondary voltage. This kind of transformer "step down" the voltage applied to it. For instance, a step-down transformer is needed to use a 110v product in a country with a 220v supply.

Step down transformers convert electrical voltage from one level or phase configuration usually down to a lower level. They can include features for electrical isolation, power distribution, and control and instrumentation applications. Step down transformers typically rely on the principle of magnetic induction between coils to convert voltage and/or current levels.

Step down transformers are made from two or more coils of insulated wire wound around a core made of iron. When voltage is applied to one coil (frequently called the primary or input) it magnetizes the iron core, which induces a voltage in the other coil, (frequently called the secondary or output). The turn's ratio of the two sets of windings determines the amount of voltage transformation.

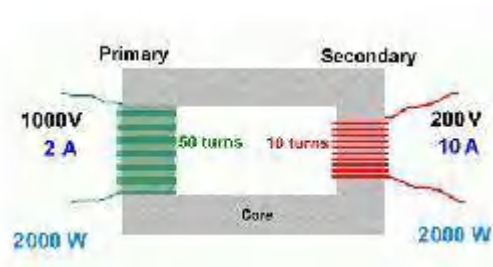


Figure 3.2.3: Step-Down Transformer

An example of this would be: 100 turns on the primary and 50 turns on the secondary, a ratio of 2 to 1.

Step down transformers can be considered nothing more than a voltage ratio device.

With step down transformers the voltage ratio between primary and secondary will mirror the "turn's ratio" (except for single phase smaller than 1 kva which have compensated secondary). A practical application of this 2 to 1 turn's ratio would be a 480 to 240 voltage step down. Note

that if the input were 440 volts then the output would be 220 volts. The ratio between input and output voltage will stay constant. Transformers should not be operated at voltages higher than the nameplate rating but may be operated at lower voltages than rated. Because of this it is possible to do some non-standard applications using standard transformers.

Single-phase step-down transformers 1 kva and larger may also be reverse connected to step-down or step-up voltages. (Note: single phase step up or step-down transformers sized less than 1 KVA should not be reverse connected because the secondary windings have additional turns to overcome a voltage drop when the load is applied. If reverse connected, the output voltage will be less than desired.)

Step-Up Transformer:

A step-up transformer has more turns of wire on the secondary coil, which makes a larger induced voltage in the secondary coil. It is called a step up transformer because the voltage output is larger than the voltage input.

Step-up transformer 110v 220v design is one whose secondary voltage is greater than its primary voltage. This kind of transformer "steps up" the voltage applied to it. For instance, a stepup transformer is needed to use a 220v product in a country with a 110v supply.

A step-up transformer 110v 220v converts alternating current (AC) from one voltage to another voltage. It has no moving parts and works on a magnetic induction principle; it can be designed to "step-up" or "step-down" voltage. So, a step-up transformer increases the voltage and a step-down transformer decreases the voltage.

The primary components for voltage transformation are the step-up transformer core and coil. The insulation is placed between the turns of wire to prevent shorting to one another or to ground. This is typically comprised of Mylar, Nomex, Kraft paper, varnish, or other materials. As a transformer has no moving parts, it will typically have a life expectancy between 20 and 25 years.

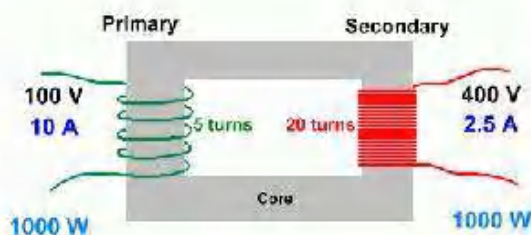


Figure 3.2.4: Step-Up Transformer

Applications

Generally, these **Step-Up Transformers** are used in industries applications only.

Turns Ratio and Voltage

The ratio of the number of turns on the primary and secondary coils determines the ratio of the voltages...

$$\frac{V_s}{V_p} = \frac{N_s}{N_p}$$

...where V_p is the primary (input) voltage, V_s is the secondary (output) voltage, N_p is the number of turns on the primary coil, and N_s is the number of turns on the secondary coil.

3.2.2 Diodes

Diodes allow electricity to flow in only one direction. The arrow of the circuit symbol shows the direction in which the current can flow. Diodes are the electrical version of a valve and early diodes were actually called valves.



Figure 3.3 Diode Symbol

A **diode** is a device which only allows current to flow through it in one direction. In this direction, the diode is said to be 'forward-biased' and the only effect on the signal is that there will be a voltage loss of around 0.7V. In the opposite direction, the diode is said to be 'reverse-biased' and no current will flow through it.

3.2.3 Rectifier

The purpose of a rectifier is to convert an AC waveform into a DC waveform (OR) Rectifier converts AC current or voltages into DC current or voltage. There are two different rectification circuits, known as '**half-wave**' and '**full-wave**' rectifiers. Both use components called **diodes** to convert **AC into DC**.

The Half-wave Rectifier

The half-wave rectifier is the simplest type of rectifier since it only uses one diode, as shown in figure.

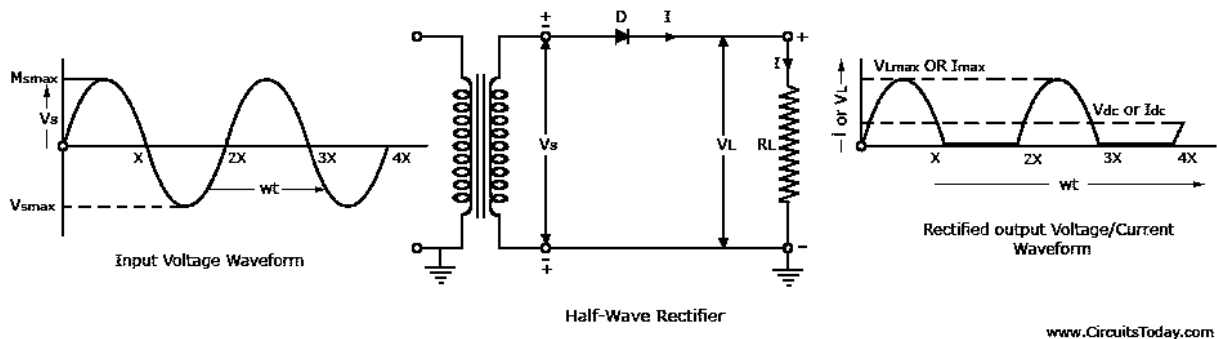


Figure 3.4 Half Wave Rectifier

Figure 2 shows the AC input waveform to this circuit and the resulting output. As you can see, when the AC input is positive, the diode is forward-biased and lets the current through. When the AC input is negative, the diode is reverse-biased and the diode does not let any current through, meaning the output is 0V. Because there is a 0.7V voltage loss across the diode, the peak output voltage will be 0.7V less than V_s .

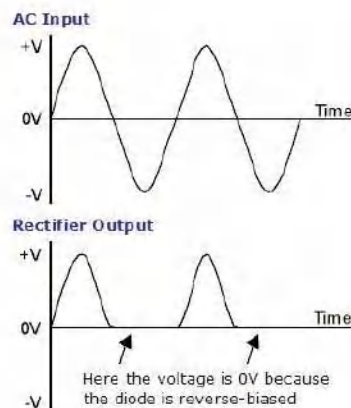


Figure 3.5 Half-Wave Rectification

While the output of the half-wave rectifier is DC (it is all positive), it would not be suitable as a power supply for a circuit. Firstly, the output voltage continually varies between 0V and $V_s - 0.7V$, and secondly, for half the time there is no output at all.

The Full-wave Rectifier

The circuit in figure 3 addresses the second of these problems since at no time is the output voltage 0V. This time four diodes are arranged so that both the positive and negative parts of the AC waveform are converted to DC. The resulting waveform is shown in figure 4.

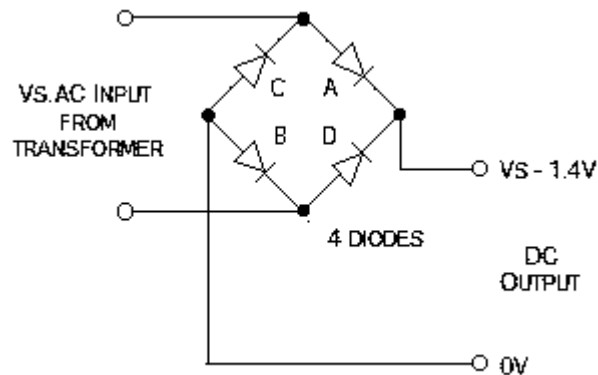


Figure 3.6 Full-Wave Rectifier

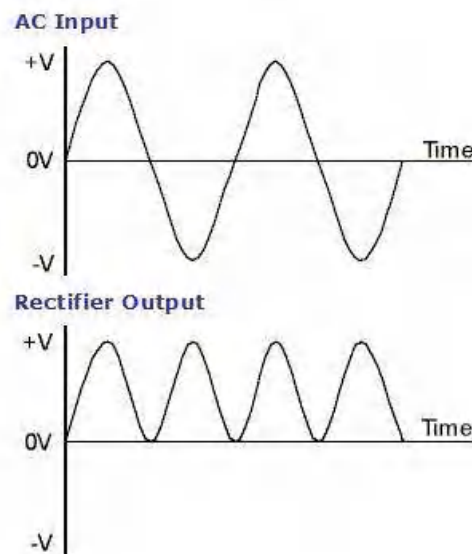


Figure 3.7 Full-Wave Rectification

When the AC input is positive, diodes A and B are forward-biased, while diodes C and D are reverse-biased. When the AC input is negative, the opposite is true - diodes C and D are forward-biased, while diodes A and B are reverse-biased.

While the full-wave rectifier is an improvement on the half-wave rectifier, its output still isn't suitable as a power supply for most circuits since the output voltage still varies between 0V and $V_s - 1.4V$. So, if you put 12V AC in, you will 10.6V DC out.

Capacitor Filter

The **capacitor-input filter**, also called "Pi" filter due to its shape that looks like the, is a type of. Filter circuits are used to remove unwanted or undesired frequencies from a signal.

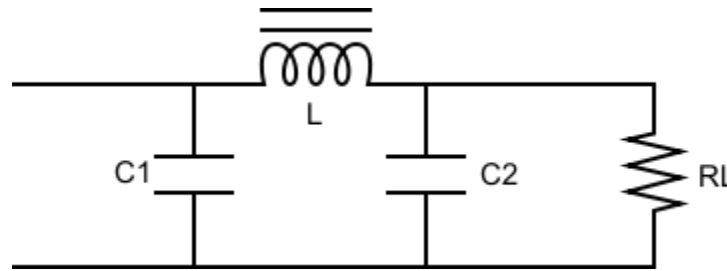


Figure 3.8 Capacitor Filter

A typical capacitor input filter consists of a filter capacitor C_1 , connected across the rectifier output, an inductor L , in series and another filter capacitor connected across the load.

1. The capacitor C_1 offers low reactance to the AC component of the rectifier output while it offers infinite reactance to the DC component. As a result the capacitor shunts an appreciable amount of the AC component while the DC component continues its journey to the inductor L .
2. The inductor L offers high reactance to the AC component but it offers almost zero reactance to the DC component. As a result, the DC component flows through the inductor while the AC component is blocked.
3. The capacitor C_2 bypasses the AC component which the inductor had failed to block. As a result, only the DC component appears across the load R_L .

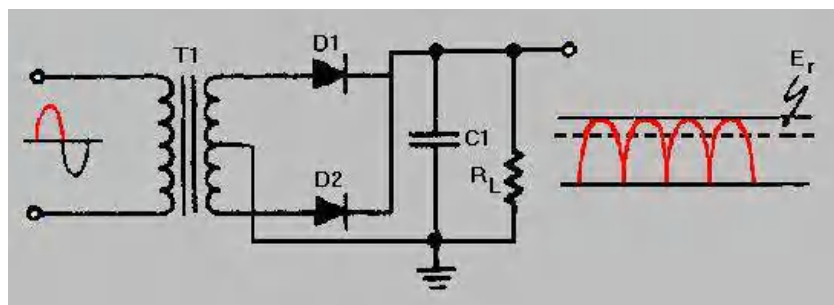


Figure 3.8.1: Centered Tapped Full-Wave Rectifier with a Capacitor Filter

3.2.4 Voltage Regulator:

A **voltage regulator** is an electrical regulator designed to automatically maintain a constant voltage level. It may use an electromechanical mechanism, or passive or active electronic components. Depending on the design, it may be used to regulate one or more AC or DC voltages. There are two types of regulator are they.

- Positive Voltage Series (78xx) and
- Negative Voltage Series (79xx)

78xx: '78' indicate the positive series and 'xx' indicates the voltage rating. Suppose 7805 produces the maximum 5V. '05' indicates the regulator output is 5V.

79xx: '78' indicate the negative series and 'xx' indicates the voltage rating. Suppose 7905 produces the maximum -5V. '05' indicates the regulator output is -5V.

These regulators consists the three pins there are **Pin1:**

It is used for input pin.

Pin2: This is ground pin for regulator.

Pin3: It is used for output pin. Through this pin we get the output.

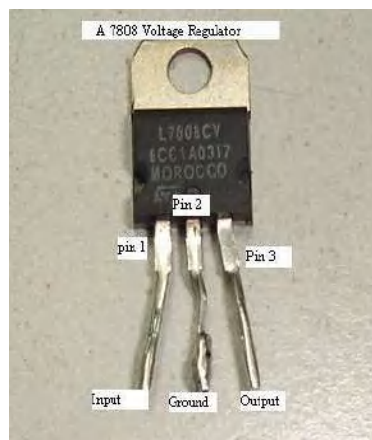


Figure 3.9 Regulator



CHAPTER 4

PROTEUS SOFTWARE

SOFTWARE

4.1 Proteus

Proteus is a simulation and design software tool developed by Lab centre Electronics for Electrical and Electronic circuit design. It also possess 2D CAD drawing feature.

It deserves to bear the tagline “From concept to completion”.

4.1.1 About Proteus

It is a software suite containing schematic, simulation as well as PCB designing. ISIS is the software used to draw schematics and simulate the circuits in real time. The simulation allows human access during run time, thus providing real time simulation.

ARES is used for PCB designing. It has the feature of viewing output in 3D view of the designed PCB along with components. The designer can also develop 2D drawings for the product.

4.1.2 Features

ISIS has wide range of components in its library. It has sources, signal generators, measurement and analysis tools like oscilloscope, voltmeter, ammeter etc., probes for real time monitoring of the parameters of the circuit, switches, displays, loads like motors and lamps, discrete components like resistors, capacitors, inductors, transformers, digital and analog Integrated circuits, semi-conductor switches, relays, microcontrollers, processors, sensors etc.

ARES offers PCB designing up to 14 inner layers, with surface mount and through hole packages. It is embedded with the footprints of different category of components like ICs, transistors, headers, connectors and other discrete components. It offers Auto routing and manual routing options to the PCB Designer. The schematic drawn in the ISIS can be directly transferred ARES.

4.2 Starting New Design

Step 1: Open ISIS software and select New design in File menu

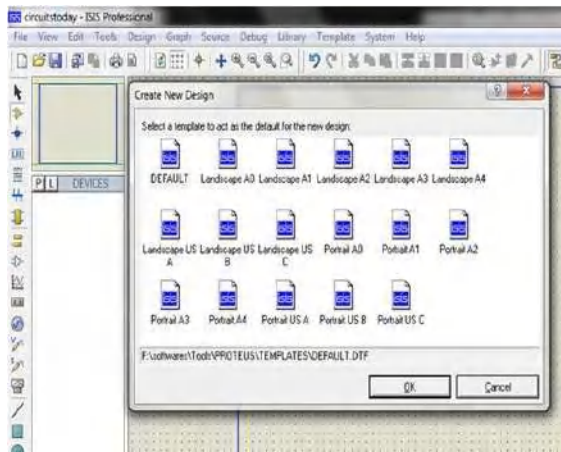


Figure 4.1 Proteus File Menu

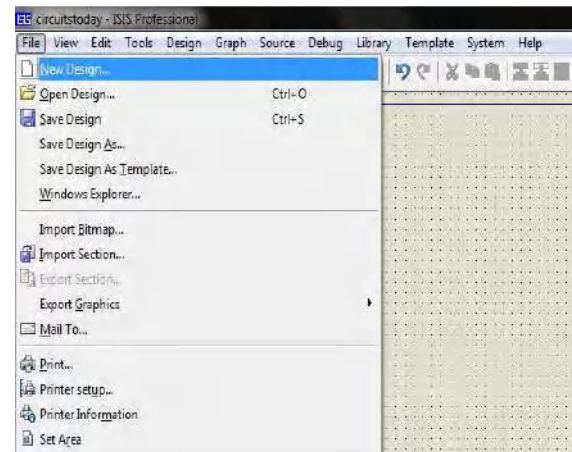


Figure 4.2 Proteus Default Template Select

Step 2: A dialogue box appears to save the current design. However, we are creating a new design file so you can click Yes or No depending on the content of the present file. Then a Pop-Up appears asking to select the template. It is similar to selecting the paper size while printing. For now, select default or according to the layout size of the circuit.

Step 3: An untitled design sheet will be opened, save it according to your wish, it is better to create a new folder for every layout as it generates other files supporting your design. However, it is not mandatory.

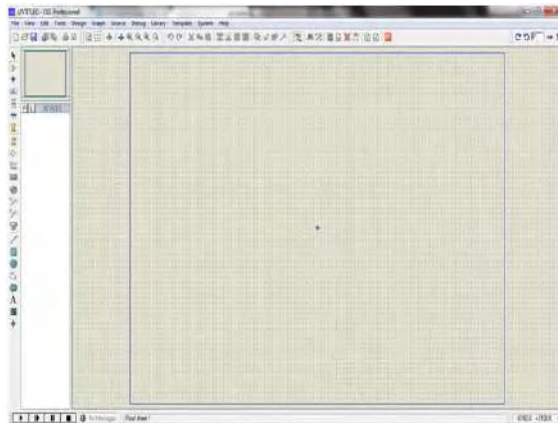


Figure 4.3 Proteus Design Sheet

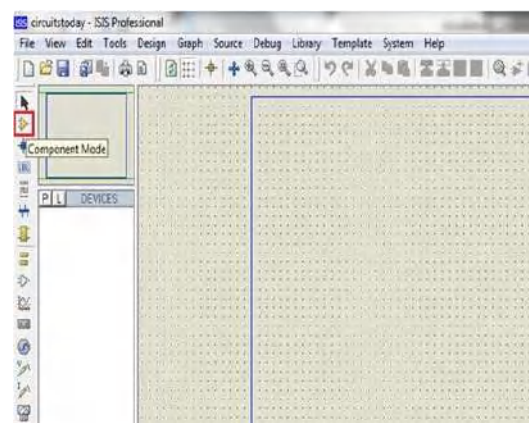


Figure 4.4 Component Mode Step

4: To Select components, Click on the component mode button.

Step 5: Click on Pick from Libraries. It shows the categories of components available and a search option to enter the part name.

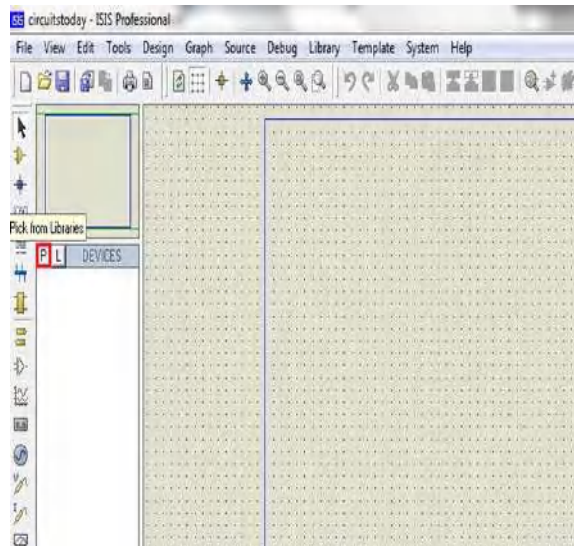


Figure 4.5 Pick from Libraries

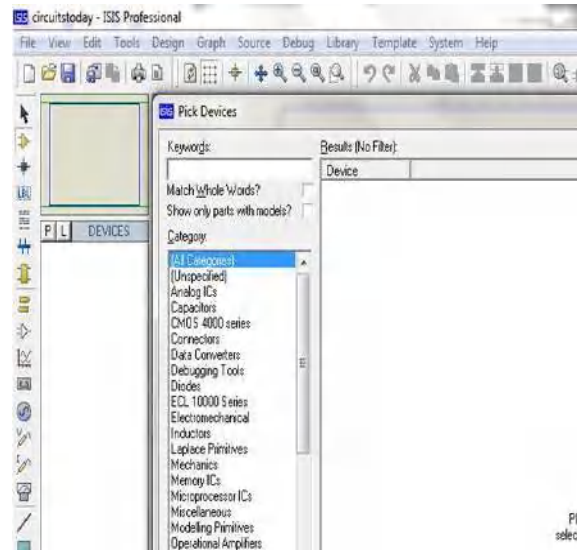


Figure 4.6 Keywords Textbox

Step 6: Select the components from categories or type the part name in Keywords text box.

Example shows selection of push button. Select the components accordingly.

Step 7: The selected components will appear in the devices list. Select the component and place it in the design sheet by left click.

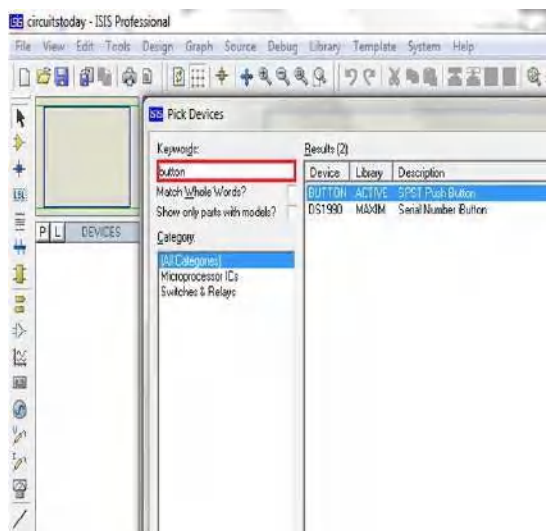


Figure 4.7 Push Button Selection

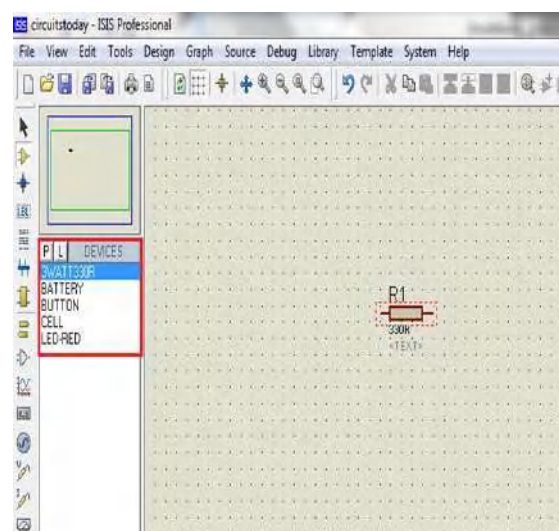


Figure 4.8 Component Selection

Place all the required components and route the wires i.e., make connections.

Either selection mode above the component mode or component mode allows to connect through wires. Left click from one terminal to other to make connection. Double right-click on the connected wire or the component to remove connection or the component respectively.

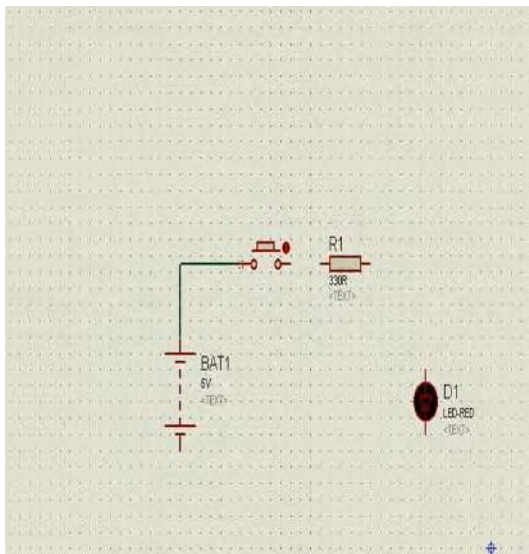


Figure 4.9 Component Properties Selection

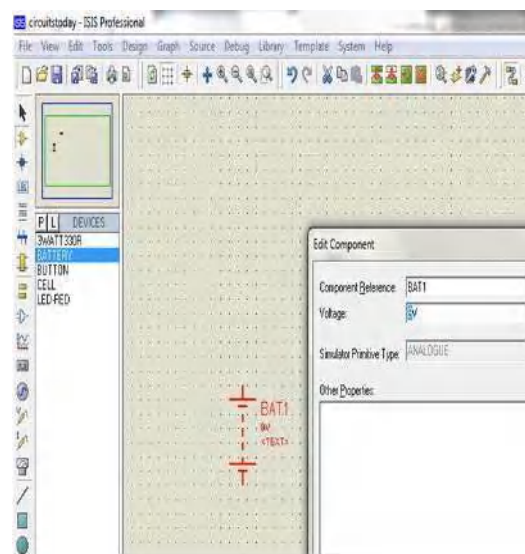


Figure 4.10 Component Properties Edit

Double click on the component to edit the properties of the components and click on Ok.

Step 8: After connecting the circuit, click on the play button to run the simulation.

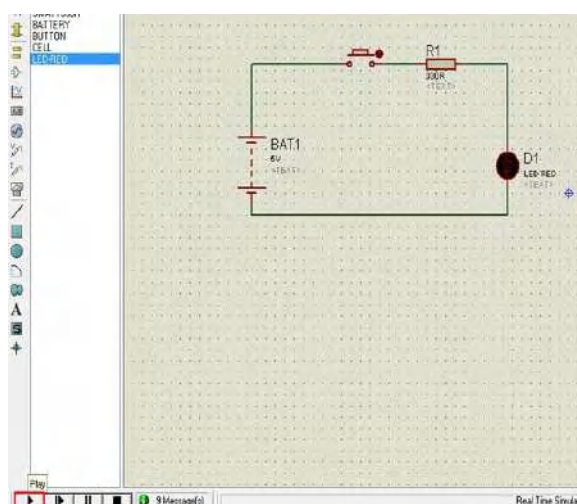


Figure 4.11 Simulation Run

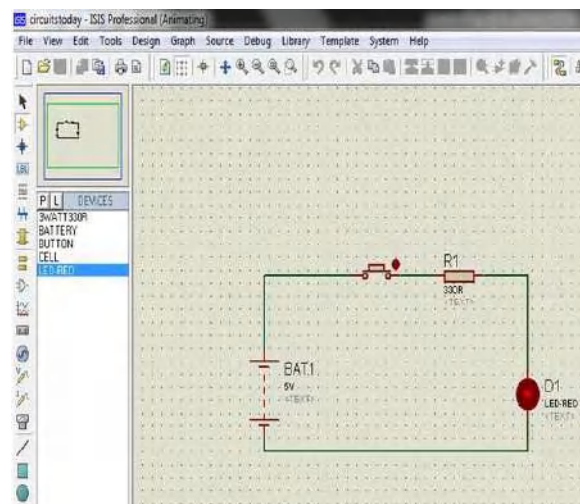


Figure 4.12 Simulation Animating

In this example simulation, the button is depressed during simulation by clicking on it to make LED glow.

Simulation can be stepped, paused or stopped at any time.

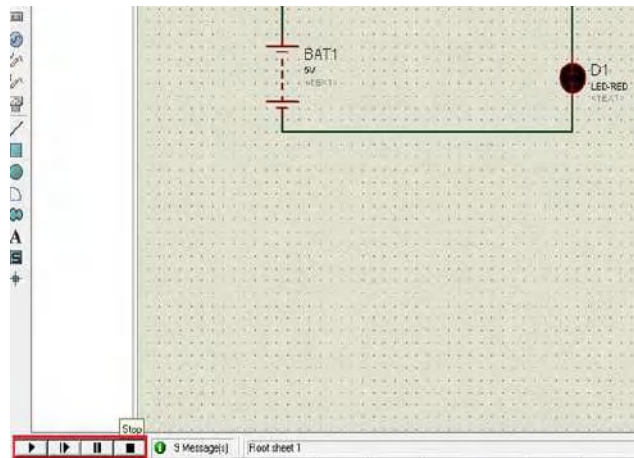


Figure 4.13 Simulation Step-Pause-Stop Buttons

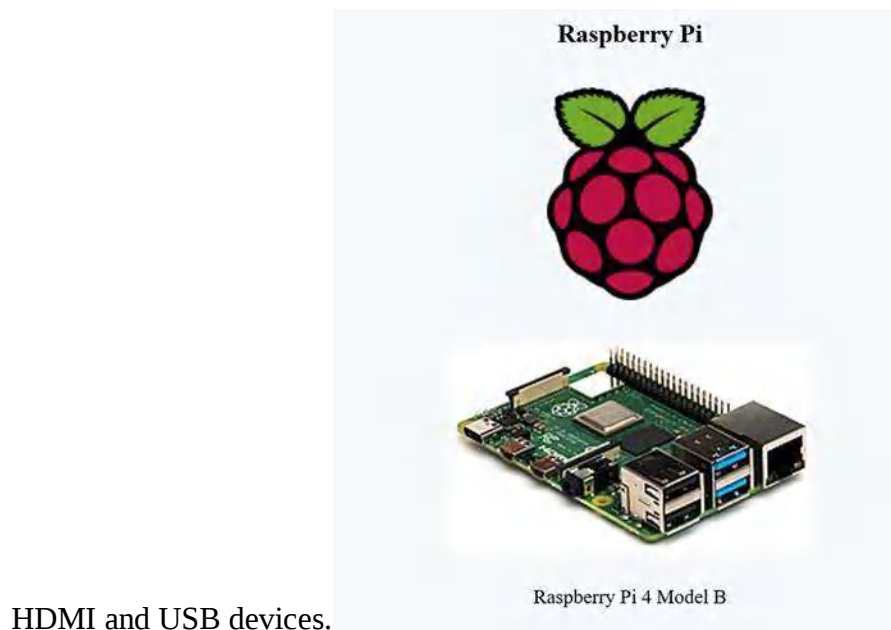
CHAPTER 5

HARDWARE REQUIREMENTS

HARDWARE

5.1`Raspberry Pi

Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation in association with Broadcom.¹ The Raspberry Pi project originally leaned towards the promotion of teaching basic computer science in schools and in developing countries. The original model became more popular than anticipated, selling outside its target market for uses such as robotics. It is widely used in many areas, such as for weather monitoring, because of its low cost, modularity, and open design. It is typically used by computer and electronic hobbyists, due adoption of



HDMI and USB devices.

Fig 5.1 Raspberry pi

After the release of the second board type, the Raspberry Pi Foundation set up a new entity, named

Raspberry Pi Trading, and installed Eben Upton as CEO, with the responsibility of developing technology. The Foundation was rededicated as an educational charity for promoting the teaching of basic computer science in schools and developing countries.

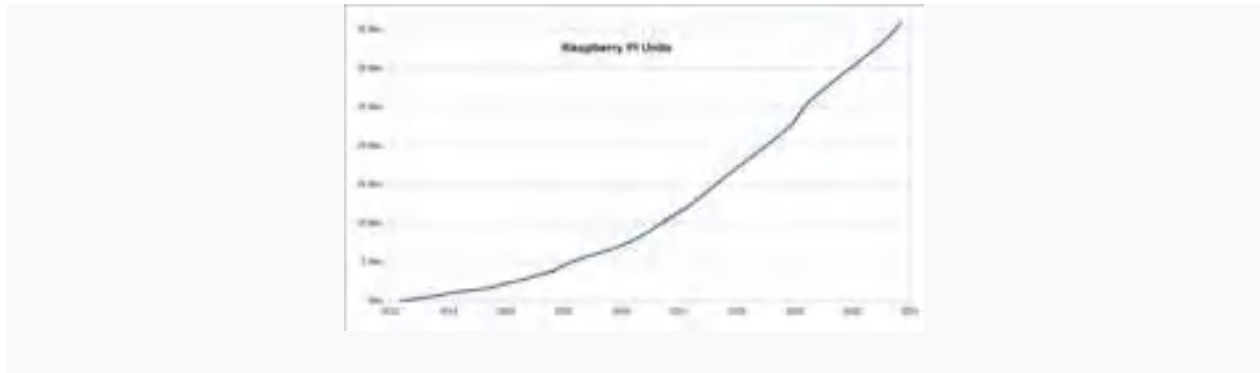


Fig 5.1.1 Sold units of the Raspberry Pi

The Raspberry Pi is one of the best-selling British computers. As of December 2019, more than thirty million boards have been sold. Most Pis are made in a Sony factory in Pen coed, Wales, while others are made in China and Japan.

5.2 Generations



Fig 5.2 The Raspberrv Pi Zero. a US\$7 model first introduced in 2015



Fig 5.2.1 The Raspberry Pi 3 B+, introduced in 2018



Fig 5.2.2 The Raspberry Pi 4 B, introduced in 2019

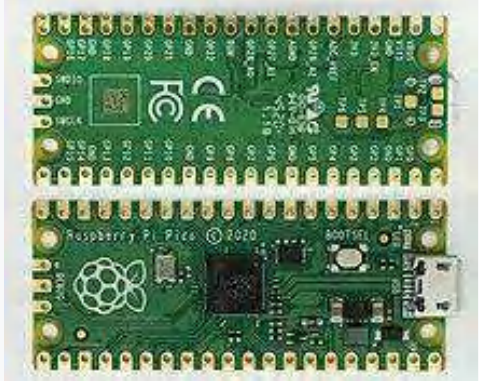


Fig 5.2.3 The Raspberry Pi Pico, introduced in 2021

Several generations of Raspberry Pis have been released. Raspberry Pi SBCs feature a Broadcom system on a chip (SoC) with an integrated ARM-compatible central processing unit (CPU) and on-chip graphics processing unit (GPU), while Raspberry Pi Pico has a RP2040 system on chip with an integrated ARM-compatible central processing unit (CPU).

The first generation (**Raspberry Pi Model B**) was released in February 2012, followed by the simpler and cheaper **Model A**. In 2014, the Foundation released a board with an improved design, **Raspberry Pi Model B+**. These first generation boards feature ARM11 processors, are approximately credit-card sized and represent the standard *mainline* form-factor. Improved A+ and B+ models were released a year later. A "Compute Module" was released in April 2014 for embedded applications.

The **Raspberry Pi 2** was released in February 2015 and initially featured a 900 MHz 32-bit quadcore ARM Cortex-A7 processor with 1 GB RAM. Later versions featured a 1.2 GHz 64-bit quadcore ARM Cortex-A53 processor.

A **Raspberry Pi Zero** with smaller size and reduced input/output (I/O) and general-purpose input/output (GPIO) capabilities was released in November 2015 for US\$5. On 28 February 2017, the **Raspberry Pi Zero W** was launched, a version of the Zero with Wi-Fi and Bluetooth capabilities, for US\$10. On 12 January 2018, the **Raspberry Pi Zero WH** was launched, a version of the Zero W with pre-soldered GPIO headers.

Raspberry Pi 3 Model B was released in February 2016 with a 1.2 GHz 64-bit quad core ARM Cortex-A53 processor, on-board 802.11n Wi-Fi, Bluetooth and USB boot capabilities. On Pi Day 2018, the **Raspberry Pi 3 Model B+** was launched with a faster 1.4 GHz processor, a threetimes faster gigabit Ethernet (throughput limited to ca. 300 Mbit/s by the internal USB 2.0 connection), and 2.4 / 5 GHz dual-band 802.11ac Wi-Fi (100 Mbit/s). Other features are Power over Ethernet (PoE) (with the add-on PoE HAT), USB boot and network boot (an SD card is no longer required).

Raspberry Pi 4 Model B was released in June 2019 with a 1.5 GHz 64-bit quad core ARM Cortex-A72 processor, on-board 802.11ac Wi-Fi, Bluetooth 5, full gigabit Ethernet (throughput not limited), two USB 2.0 ports, two USB 3.0 ports, and dual-monitor support via a pair of micro HDMI (HDMI Type D) ports for up to 4K resolution. The Pi 4 is also powered via a USB-C port, enabling additional power to be provided to downstream peripherals, when used with an appropriate PSU. The initial Raspberry Pi 4 board has a design flaw where third-party emarked USB cables, such as those used on Apple MacBook, incorrectly identify it and refuse to provide power. Tom's Hardware tested 14 different cables and found that 11 of them turned on and powered the Pi without issue. The design flaw was fixed in revision 1.2 of the board, released in late 2019.

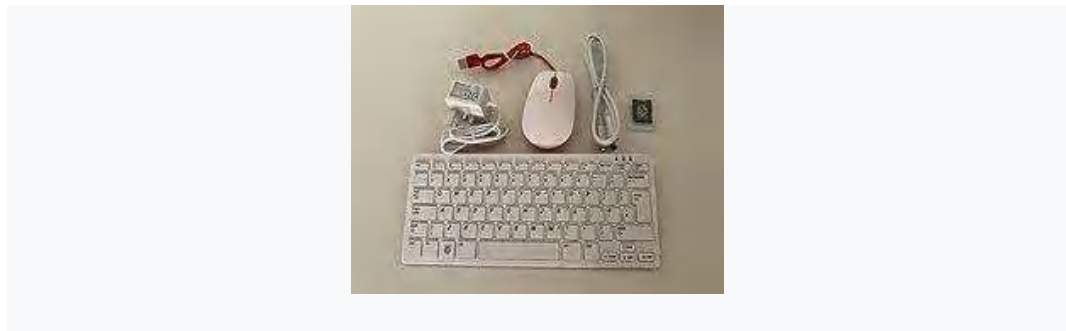


Fig 5.2.4 Raspberry Pi 400 Kit

Raspberry Pi 400 was released in November 2020. It features a custom board that is derived from the existing Raspberry Pi 4, specifically remodeled with a keyboard attached. A robust cooling solution similar to the one found in a Commodore 64 allows the Raspberry Pi 400's Broadcom BCM2711C0 processor to be clocked at 1.8 GHz, which is slightly higher than the Raspberry Pi 4 it's based on. The keyboard-computer features 4 GB of LPDDR4 RAM.

Raspberry Pi Pico was released in January 2021 with a retail price of \$4. It was Raspberry Pi's first board based upon a single microcontroller chip; the RP2040, which was designed by Raspberry Pi in the UK. The Pico has 264 KB of RAM and 2 MB of flash memory. It is programmable in Micro Python, Circuit Python, and C. It has partnered with Adafruit, Pimoroni, Arduino and Spark fun to build Accessories for Raspberry Pi Pico and variety of other boards using RP2040 Silicon Platform. Rather than perform the role of general purpose computer (like the others in the range) it is designed for physical computing, similar in concept to an Arduino.

5.3 Hardware

The Raspberry Pi hardware has evolved through several versions that feature variations in the type of the central processing unit, amount of memory capacity, networking support, and peripheraldevice support.

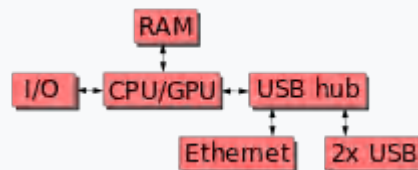


Fig 5.3 Hardware Architecture

This block diagram describes models B, B+, A and A+. The Pi Zero models are similar, but lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-port USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port. Unlike all other Pi models, the 40 pin GPIO connector is omitted on the Pi Zero, with solderable through-holes only in the pin locations. The Pi Zero WH remedies this.

Processor speed ranges from 700 MHz to 1.4 GHz for the Pi 3 Model B+ or 1.5 GHz for the Pi 4; on-board memory ranges from 256 MB to 1 GB random-access memory (RAM), with up to 8 GB available on the Pi 4. Secure Digital (SD) cards in MicroSD form factor (SDHC on early models) are used to store the operating system and program memory. The boards have one to five USB ports. For video output, HDMI and composite video are supported, with a standard 3.5 mm tip-ring-sleeve jack for audio output. Lower-level output is provided by a number of GPIO pins, which support common protocols like I²C. The B-models have an 8P8C Ethernet port and the Pi 3, Pi 4 and Pi Zero W have on-board Wi-

Fi 802.11n and Bluetooth.

Processor



Fig 5.3.1 The Raspberry Pi 2B uses a 32-bit 900 MHz quad -core ARM Cortex-A7 processor.

The Broadcom BCM2835 SoC used in the first generation Raspberry Pi includes a 700 MHz ARM1176JZF-Sprocessor, Video Core IV graphic processing unit (GPU), and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) cache of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible. The ARM1176JZ(F)-S is the same CPU used in the original iPhone, although at a higher clock rate, and mated with a much faster GPU.

The earlier V1.1 model of the Raspberry Pi 2 used a Broadcom BCM2836 SoC with a 900 MHz 32-bit, quad-core ARM Cortex-A7 processor, with 256 KB shared L2 cache. The Raspberry Pi 2 V1.2 was upgraded to a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quadcore ARM Cortex-A53 processor, the same SoC which is used on the Raspberry Pi 3, but underclocked (by default) to the same 900 MHz CPU clock speed as the V1.1. The BCM2836 SoC is no longer in production as of late 2016.



The Raspberry Pi 3 Model B uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quadcore ARM Cortex-A53 processor, with 512 KB shared L2 cache. The Model A+ and B+ are 1.4 GHz.

The Raspberry Pi 4 uses a Broadcom BCM2711 SoC with a 1.5 GHz 64-bit quad-core ARM Cortex-A72 processor, with 1 MB shared L2 cache. Unlike previous models, which all used a custom interrupt controller poorly suited for virtualization, the interrupt controller on this SoC is compatible with the ARM Generic Interrupt Controller (GIC) architecture 2.0, providing hardware support for interrupt distribution when using ARM virtualization capabilities.

The Raspberry Pi Zero and Zero W use the same Broadcom BCM2835 SoC as the first-generation Raspberry Pi, although now running at 1 GHz CPU clock speed.

The Raspberry Pi Pico uses the RP2040 running at 133 MHz

Performance

While operating at 700 MHz by default, the first generation Raspberry Pi provided a real-world performance roughly equivalent to 0.041 GFLOPS. On the CPU level the performance is similar to a 300 MHz Pentium II of 1997–99. The GPU provides 1 G pixel/s or 1.5 Texel/s of graphics processing or 24 GFLOPS of general purpose computing performance. The graphical capabilities of the Raspberry Pi are roughly equivalent to the performance of the Xbox of 2001.

Raspberry Pi 2 V1.1 included a quad-core Cortex-A7 CPU running at 900 MHz and 1 GB RAM. It was described as 4–6 times more powerful than its predecessor. The GPU was identical to the original. In parallelized benchmarks, the Raspberry Pi 2 V1.1 could be up to 14 times faster than a Raspberry Pi 1 Model B+.

The Raspberry Pi 3, with a quad-core Cortex-A53 processor, is described as having ten times the performance of a Raspberry Pi 1. Benchmarks showed the Raspberry Pi 3 to be approximately 80% faster than the Raspberry Pi 2 in parallelized tasks.

The Raspberry Pi 4, with a quad-core Cortex-A72 processor, is described as having three times the performance of a Raspberry Pi 3.



Overclocking

Most Raspberry Pi systems-on-chip could be overclocked to 800 MHz, and some to 1000 MHz. There are reports the Raspberry Pi 2 can be similarly overclocked, in extreme cases, even to 1500 MHz (discarding all safety features and over-voltage limitations). In the Raspbian Linux distro the overclocking options on boot can be done by a software command running "sudo raspyconfig" without voiding the warranty. In those cases the Pi automatically shuts the overclocking down if the chip temperature reaches 85 °C (185 °F), but it is possible to override automatic overvoltage and overclocking settings (voiding the warranty); an appropriately sized heat sink is needed to protect the chip from serious overheating.

Newer versions of the firmware contain the option to choose between five overclock ("turbo") presets that, when used, attempt to maximize the performance of the SoC without impairing the lifetime of the board. This is done by monitoring the core temperature of the chip and the CPU load, and dynamically adjusting clock speeds and the core voltage. When the demand is low on the CPU or it is running too hot, the performance is throttled, but if the CPU has much to do and the chip's temperature is acceptable, performance is temporarily increased with clock speeds of up to 1 GHz, depending on the board version and on which of the turbo settings is used. The overclocking modes are:

- none; 700 MHz ARM, 250 MHz core, 400 MHz SDRAM, 0 overvolting,
- modest; 800 MHz ARM, 250 MHz core, 400 MHz SDRAM, 0 overvolting,
- medium; 900 MHz ARM, 250 MHz core, 450 MHz SDRAM, 2 overvolting,
- high; 950 MHz ARM, 250 MHz core, 450 MHz SDRAM, 6 overvolting,
- turbo; 1000 MHz ARM, 500 MHz core, 600 MHz SDRAM, 6 overvolting,
- Pi 2; 1000 MHz ARM, 500 MHz core, 500 MHz SDRAM, 2 overvolting,
- Pi 3; 1100 MHz ARM, 550 MHz core, 500 MHz SDRAM, 6 overvolting. In system information the CPU speed appears as 1200 MHz. When idling, speed lowers to 600 MHz.

In the highest (*turbo*) mode the SDRAM clock speed was originally 500 MHz, but this was later changed to 600 MHz because of occasional SD card corruption. Simultaneously, in *high* mode the core clock speed was lowered from 450 to 250 MHz, and in *medium* mode from 333 to 250 MHz.



The CPU of the first and second generation Raspberry Pi board did not require cooling with a heat sink or fan, even when overclocked, but the Raspberry Pi 3 may generate more heat when overclocked.

RAM

The early designs of the Raspberry Pi Model A and B boards included only 256 MB of random access memory (RAM). Of this, the early beta Model B boards allocated 128 MB to the GPU by default, leaving only 128 MB for the CPU. On the early 256 MB releases of models A and B, three different splits were possible. The default split was 192 MB for the CPU, which should be sufficient for standalone 1080p video decoding, or for simple 3D processing. 224 MB was for Linux processing only, with only a 1080p framebuffer, and was likely to fail for any video or 3D. 128 MB was for heavy 3D processing, possibly also with video decoding. In comparison, the Nokia 701 uses 128 MB for the Broadcom Video Core IV.

The later Model B with 512 MB RAM, was released on 15 October 2012 and was initially released with new standard memory split files (arm256_start.elf, arm384_start.elf, arm496_start.elf) with 256 MB, 384 MB, and 496 MB CPU RAM, and with 256 MB, 128 MB, and 16 MB video RAM, respectively. But about one week later, the foundation released a new version of start.elf that could read a new entry in config.txt (gpu_mem=xx) and could dynamically assign an amount of RAM (from 16 to 256 MB in 8 MB steps) to the GPU, obsoleting the older method of splitting memory, and a single start.elf worked the same for 256 MB and 512 MB Raspberry Pis.

The Raspberry Pi 2 has 1 GB of RAM.

The Raspberry Pi 3 has 1 GB of RAM in the B and B+ models, and 512 MB of RAM in the A+ model. The Raspberry Pi Zero and Zero W have 512 MB of RAM.

The Raspberry Pi 4 is available with 2, 4 or 8 GB of RAM. A 1 GB model was originally available at launch in June 2019 but was discontinued in March 2020, and the 8 GB model was introduced in May 2020.

Networking

The Model A, A+ and Pi Zero have no Ethernet circuitry and are commonly connected to a network using an external user-supplied USB Ethernet or Wi-Fi adapter. On the Model B and

B+ the Ethernet port is provided by a built-in USB Ethernet adapter using the SMSC LAN9514 chip. The Raspberry Pi 3 and Pi Zero W (wireless) are equipped with 2.4 GHz WIFI 802.11n (150 Mbit/s) and Bluetooth 4.1 (24 Mbit/s) based on the Broadcom BCM43438 Full MAC chip with no official support for monitor mode (though it was implemented through unofficial firmware patching) and the Pi 3 also has a 10/100 Mbit/s Ethernet port. The Raspberry Pi 3B+ features dualband IEEE 802.11b/g/n/ac Wi-Fi, Bluetooth 4.2, and Gigabit Ethernet (limited to approximately 300 Mbit/s by the USB 2.0 bus between it and the SoC). The Raspberry Pi 4 has full gigabit

Ethernet (throughput is not limited as it is not funneled via the USB chip.)

Special-purpose features

The RPi Zero, RPi1A, RPi3A+^[74] and RPi4 can be used as a USB device or "USB gadget", plugged into another computer via a USB port on another machine. It can be configured in multiple ways, for example to show up as a serial device or an ethernet device. Although originally requiring software patches, this was added into the mainline Raspbian distribution in May 2016.

Raspberry Pi models with a newer chipset can boot from USB mass storage, such as from a flash drive. Booting from USB mass storage is not available in the original Raspberry Pi models, the Raspberry Pi Zero, the Raspberry Pi Pico, the Raspberry Pi 2 A models and in Raspberry Pi 2 B models with a lower version than 1.2.

Peripherals



Fig 5.3.2 The Model 2B boards incorporate four USB ports for connecting peripherals.

Although often pre-configured to operate as a headless computer, the Raspberry Pi may also optionally be operated with any generic USB computer keyboard and mouse. It may also be used with USB storage, USB to MIDI converters, and virtually any other device/component with USB

capabilities, depending on the installed device drivers in the underlying operating system (many of which are included by default).

Other peripherals can be attached through the various pins and connectors on the surface of the Raspberry Pi.

Video



Fig 5.3.3 The early Raspberry Pi 1 Model A, with an HDMI port and a standard RCA composite video port for older displays

The video controller can generate standard modern TV resolutions, such as HD and Full HD, and higher or lower monitor resolutions as well as older NTSC or PAL standard CRT TV resolutions.

As shipped (i.e., without custom overclocking) it can support the following resolutions:

640×350 EGA; 640×480 VGA; 800×600 SVGA; 1024×768 XGA; 1280×720 720p HDTV;
1280×768 WXGA variant; 1280×800 WXGA variant; 1280×1024 SXGA;
1366×768 WXGA variant; 1400×1050 SXGA+; 1600×1200 UXGA; 1680×1050 WXGA+;
1920×1080 1080p HDTV; 1920×1200 WUXGA.

Higher resolutions, up to 2048×1152, may work or even 3840×2160 at 15 Hz (too low a frame rate for convincing video). Allowing the highest resolutions does not imply that the GPU can decode video formats at these resolutions; in fact, the Raspberry Pis are known to not work reliably for H.265 (at those high resolutions), commonly used for very high resolutions (however, most common formats up to Full HD do work).

Although the Raspberry Pi 3 does not have H.265 decoding hardware, the CPU is more powerful than its predecessors, potentially fast enough to allow the decoding of H.265-encoded videos in



software. The GPU in the Raspberry Pi 3 runs at higher clock frequencies of 300 MHz or 400 MHz, compared to previous versions which ran at 250 MHz

The Raspberry Pis can also generate 576i and 480i composite video signals, as used on old-style (CRT) TV screens and less-expensive monitors through standard connectors – either RCA or 3.5 mm phono connector depending on model. The television signal standards supported are PALB/G/H/I/D, PAL-M, PAL-N, NTSC and NTSC-J.

Real-time clock

When booting, the time defaults to being set over the network using the Network Time Protocol (NTP). The source of time information can be another computer on the local network that *does* have a real-time clock, or to a NTP server on the internet. If no network connection is available, the time may be set manually or configured to assume that no time passed during the shutdown. In the latter case, the time is monotonic (files saved later in time always have later timestamps) but may be considerably earlier than the actual time. For systems that require a builtin real-time clock, a number of small, low-cost add-on boards with real-time clocks are available.

The RP2040 microcontroller has a built-in real-time clock but this cannot be set automatically without some form of user entry or network facility being added.

Connectors

General purpose input-output (GPIO) connector

Raspberry Pi 1 Models A+ and B+, Pi 2 Model B, Pi 3 Models A+, B and B+, Pi 4, and Pi Zero, Zero W, and Zero WH GPIO J8 have a 40-pin pinout. Raspberry Pi 1 Models A and B have only the first 26 pins.

In the Pi Zero and Zero W, the 40 GPIO pins are unpopulated, having the through-holes exposed for soldering instead. The Zero WH (Wireless + Header) has the header pins preinstalled.

**Table 5.1 GPIO Pins connections**

GPIO#	2nd func.	Pin#		Pin#	2nd func.	GPIO#
	3	SCL1 (I ² C)				GND
2	4	GCLK	5 7		8	TXD0 (UART) 14
		GND			10	RXD0 (UART) 15
	17	GEN0	11		12	GEN1 18
	27	GEN2	13		14	GND
	22	GEN3	15		16	GEN4 23
		+3.3 V	17		18	GEN5 24
	10	MOSI (SPI)	19		20	GND
	9	MISO (SPI)	21		22	GEN6 25

5.4 Software

Operating systems



Fig 5.4 Various operating systems for the Raspberry Pi can be installed on a MicroSD, MiniSD or SD card, depending on the board and available adapters; seen here is the

MicroSD slot located on the bottom of a Raspberry Pi 2 board.

The Raspberry Pi Foundation provides Raspberry Pi OS (formerly called Raspbian), a Debianbased (32-bit) Linux distribution for download, as well as third-party Ubuntu, Windows 10 IoT

Core, RISC OS, and Libeled (specialized media center distribution). It promotes Python and Scratch as the main programming languages, with support for many other languages. The default firmware is closed source, while unofficial open source is available. Many other operating systems can also run on the Raspberry Pi. Third-party operating systems available via the official website include Ubuntu MATE, Windows 10 IoT Core, RISC OS and specialized distributions for the Kody media center and classroom management. The formally verified microkernel seL4 is also supported.

Other operating systems (not Linux-based)

- Broadcom VCOS – Proprietary operating system which includes an abstraction layer designed to integrate with existing kernels, such as ThreadX (which is used on the VideoCore4 processor), providing drivers and middleware for application development. In the case of the Raspberry Pi, this includes an application to start the ARM processor(s) and provide the publicly documented API over a mailbox interface, serving as its firmware. An incomplete source of a Linux port of VCOS is available as part of the reference graphics driver published by

5.5 L293D

L293D is basically a high current dual motor driver/controller Integrated Circuit (IC). It is able to drive load having current up to 1A at the voltage ranging from 4.5V to 36V. Motor driver usually act as current amplifier because they receive a low current signal as an input and provides high current signal at the output.

Motors usually operates on this higher current. L-293D has to built-in H-Bridge driver circuits and is able to control two DC motors at a time in both clockwise and counterclockwise direction. It has two enable pins and they should be kept high in order to control the motor. By changing the polarity of applied signal motor can be rotated in either clockwise or counterclockwise direction. If L 293D enable pin is high, its corresponding driver will provide the desired out. If the enable pin is low, there will be no output. L-293D has different features including internal ESD protection, large voltage supply range, large output current per channel, high noise immunity input etc. L 293D plays a vital role in electronics era and has several different applications e.g. relay drivers, DC motor drivers, stepping motor drivers etc. The further detail about L 293D motor driver/controller will be given later in this tutorial.

5.5.1 Introduction to L293D

L293D is basically a motor driver or controller. It has two built-in H-bridge circuits which are able to control two DC motors simultaneously in both clockwise and counterclockwise direction. It acts as a current high amplifier because it take low current signal at its input and provides higher current signal at the output in order to drives different load e.g. stepper motor & DC motors. Its features include large input voltage supply range, large output current high noise immunity input signals etc. Its common real-life applications include stepping motor drivers, relay drivers, DC motor drivers etc. L-293D motor driver/controller is shown in the figure given below.

L293D Motor Driver



Fig 5.5 L293D pin

1. L293D Pins

L-293D has sixteen (16) pins, having different individual functions.

- All of these sixteen pins along with their serial no, are given in the table shown below.

2. L293D Pin Functions

- L 293D each pin has different tasks to perform when they are in working condition.
- The tasks assigned to each pin are given in the table shown below.

Table 5.2 L293D Pins

L293D Pins	
Pin. No	Pin Name
1	Enable 1,2
2	Input 1
3	Output 1
4	GND
5	GND
6	Output 2
7	Input 2
8	V _{CC2}
9	Enable 3,4
10	Input 3
11	Output 3
12	GND
13	GND
14	Output put 4
15	Input 4
16	V _{CC1}

3. L293D Pinout

- Pinout diagram of any device presents the pins configuration through a completely labelled diagram.
- L293D pinout diagram is shown in the figure given below.



Figure 5.4 L293D

5.6 DC Motors

The brushed DC motor is one of the earliest motor designs. Today, it is the motor of choice in the majority of variable speed and torque control applications. **Advantages**

- Easy to understand design
- Easy to control speed
- Easy to control torque
- Simple, cheap drive design

Easy to understand design

The design of the brushed DC motor is quite simple. A permanent magnetic field is created in the stator by either of two means:

- Permanent magnets
- Electro-magnetic windings

If the field is created by permanent magnets, the motor is said to be a "permanent magnet DC motor" (PMDC). If created by electromagnetic windings, the motor is often said to be a "shunt wound DC motor" (SWDC). Today, because of cost-effectiveness and reliability, the PMDC motor is the motor of choice for applications involving fractional horsepower DC motors, as well as most applications up to about three horsepower.

At five horsepower and greater, various forms of the shunt wound DC motor are most commonly used. This is because the electromagnetic windings are more cost effective than permanent magnets in this power range.

Caution: If a DC motor suffers a loss of field (if for example, the field power connections are broken), the DC motor will immediately begin to accelerate to the top speed which the loading



will allow. This can result in the motor flying apart if the motor is lightly loaded. The possible loss of field must be accounted for, particularly with shunt wound DC motors.

Opposing the stator field is the armature field, which is generated by a changing electromagnetic flux coming from windings located on the rotor. The magnetic poles of the armature field will attempt to line up with the opposite magnetic poles generated by the stator field. If we stopped the design at this point, the motor would spin until the poles were opposite one another, settle into place, and then stop -- which would make a pretty useless motor!

However, we are smarter than that. The section of the rotor where the electricity enters the rotor windings is called the commutator. The electricity is carried between the rotor and the stator by conductive graphite-copper brushes (mounted on the rotor) which contact rings on stator. Imagine power is supplied:

The motor rotates toward the pole alignment point. Just as the motor would get to this point, the brushes jump across a gap in the stator rings. Momentum carries the motor forward over this gap. When the brushes get to the other side of the gap, they contact the stator rings again and -- the polarity of the voltage is reversed in this set of rings! The motor begins accelerating again, this time trying to get to the opposite set of poles. (The momentum has carried the motor past the original pole alignment point.) This continues as the motor rotates. In most DC motors, several sets of windings or permanent magnets are present to smooth out the motion.

Easy to control speed

Controlling the speed of a brushed DC motor is simple. The higher the armature voltage, the faster the rotation. This relationship is linear to the motor's maximum speed. The maximum armature voltage which corresponds to a motor's rated speed (these motors are usually given a rated speed and a maximum speed, such as 1750/2000 rpm) are available in certain standard voltages, which roughly increase in conjunction with horsepower. Thus, the smallest industrial motors are rated 90 VDC and 180 VDC. Larger units are rated at 250 VDC and sometimes higher.

Specialty motors for use in mobile applications are rated 12, 24, or 48 VDC. Other tiny motors may be rated 5 VDC.

Most industrial DC motors will operate reliably over a speed range of about 20:1 -- down to about 5-7% of base speed. This is much better performance than the comparable AC motor. This is partly due to the simplicity of control but is also partly due to the fact that most industrial DC



motors are designed with variable speed operation in mind and have added heat dissipation features which allow lower operating speeds.

Easy to control torque

In a brushed DC motor, torque control is also simple, since output torque is proportional to current. If you limit the current, you have just limited the torque which the motor can achieve. This makes this motor ideal for delicate applications such as textile manufacturing.

Simple, cheap drive design

The result of this design is that variable speed or variable torque electronics are easy to design and manufacture. Varying the speed of a brushed DC motor requires little more than a large enough potentiometer. In practice, these have been replaced for all but sub-fractional horsepower applications by the SCR and PWM drives, which offer relatively precisely control voltage and current. Common DC drives are available at the low end (up to 2 horsepower) for under US\$100 -- and sometimes under US\$50 if precision is not important.

Large DC drives are available up to hundreds of horsepower. However, over about 10 horsepower careful consideration should be given to the price/performance tradeoffs with AC inverter systems, since the AC systems show a price advantage in the larger systems. (But they may not be capable of the application's performance requirements). ***Disadvantages***

- Expensive to produce
- Can't reliably control at lowest speeds
- Physically larger
- High maintenance
- Dust

WORKING OF DC MOTOR

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

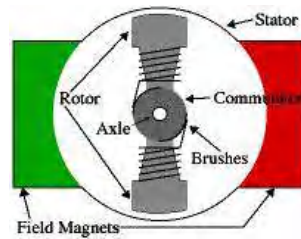


Fig 5.6 Working of DC Motors

Principle

When a rectangular coil carrying current is placed in a magnetic field, a torque acts on the coil which rotates it continuously.

When the coil rotates, the shaft attached to it also rotates and thus it is able to do mechanical work.

Every DC motor has six basic parts -- axle, rotor (a.k.a., armature), stator, commutator, field magnet(s), and brushes. In most common DC motors (and all that Beamers will see), the external magnetic field is produced by high-strength permanent magnets¹. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces. The rotor (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.



Fig 5.6.1 DC motor working principle

MOTORDRIVER CIRCUIT

The name "H-Bridge" is derived from the actual shape of the switching circuit which control the motion of the motor. It is also known as "Full Bridge". Basically there are four switching elements in the H-Bridge as shown in the figure below.

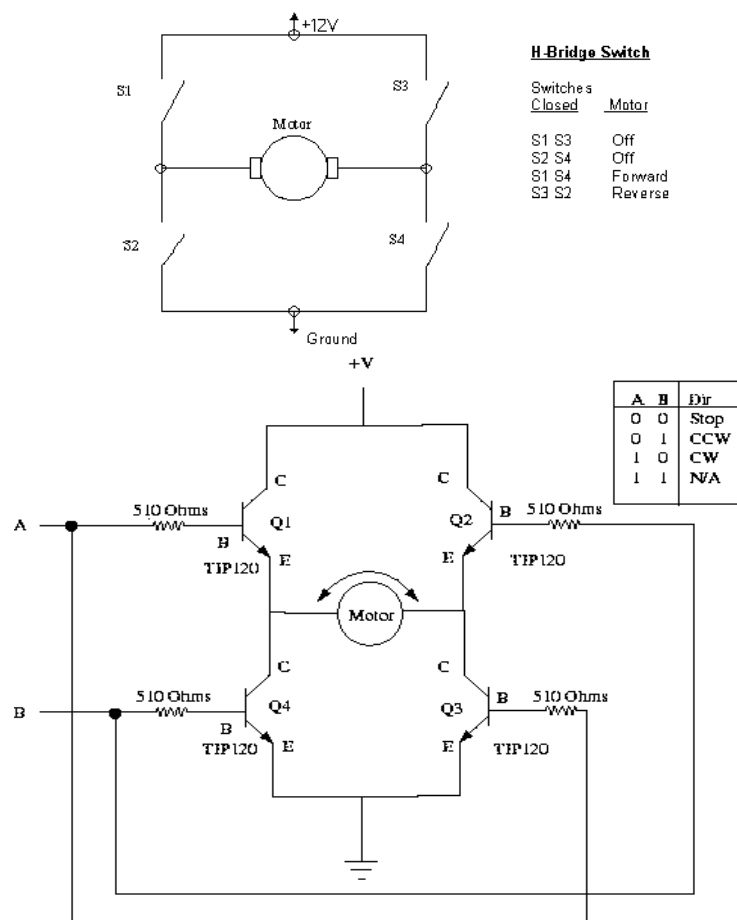


Fig 5.6.2 Motor Driver Circuit and Working

As you can see in the figure above there are four switching elements named as "High side left", "High side right", "Low side right", "Low side left". When these switches are turned on in pairs motor changes its direction accordingly. Like, if we switch on High side left and Low side right then motor rotate in forward direction, as current flows from Power supply through the motor coil goes to ground via switch low side right. This is shown in the figure below.



Fig 5.6.3 Motor Driver switching elements

Similarly, when you switch on low side left and high side right, the current flows in opposite direction and motor rotates in backward direction. This is the basic working of H-Bridge. We can also make a small truth table according to the switching of H-Bridge explained above.

Truth Table

High Left	High Right	Low Left	Low Right	Description
On	Off	Off	On	Motor runs clockwise
Off	On	On	Off	Motor runs anti-clockwise
On	On	Off	Off	Motor stops or decelerates
Off	Off	On	On	Motor stops or decelerates

As already said, H-bridge can be made with the help of transistors as well as MOSFETs, the only thing is the power handling capacity of the circuit. If motors are needed to run with high current, then lot of dissipation is there. So, heat sinks are needed to cool the circuit. Now you might be thinking why I did not discuss the cases like High side left on and Low side left on or high side right on and low side right on. Clearly seen in the diagram, you don't want to burn your power supply by shorting them. So that is why those combinations are not discussed in the truth table.

5.7 Liquid Cristal Display

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column

of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to a controller is an LCD display. Some of the most common LCDs connected to the controllers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4-bit data bus it only requires the supply lines plus 6 extra lines (RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

5.7.1 Description Of 16x2:

This is the first interfacing example for the Parallel Port. We will start with something simple. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most, if not all-Parallel Ports. It however doesn't show the use of the Status Port as an input. So what are we interfacing? A 16 Character x 2 Line LCD Module to the Parallel Port. These LCD Modules are very common these days, and are quite simple to work with, as all the logic required to run them is on board.

Schematic Diagram

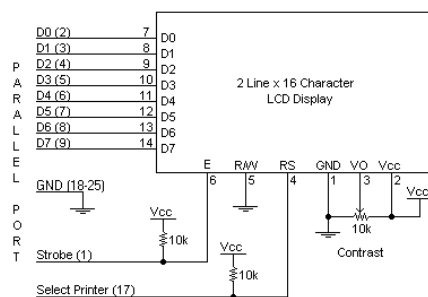


Fig 5.7 16*2 LCD

- Above is the quite simple schematic. The LCD panel's *Enable* and *Register Select* is connected to the Control Port. The Control Port is an open collector / open drain output. While most Parallel Ports have internal pull-up resistors, there are a few which don't. Therefore, by incorporating the two 10K external pull up resistors, the circuit is more portable for a wider range of computers, some of which may have no internal pull up resistors.
- We make no effort to place the Data bus into reverse direction. Therefore, we hard wire the *R/W* line of the LCD panel, into write mode. This will cause no bus conflicts on the data lines. As a result, we cannot read back the LCD's internal Busy Flag which tells us if the LCD has accepted and finished processing the last instruction. This problem is overcome by inserting known delays into our program.
- The 10k Potentiometer controls the contrast of the LCD panel. Nothing fancy here. As with all the examples, I've left the power supply out. You can use a bench power supply set to 5v or use a onboard +5 regulator. Remember a few de-coupling capacitors, especially if you have trouble with the circuit working properly.

16 x 2 Alphanumeric LCD Module Features:

- Intelligent, with built-in Hitachi HD44780 compatible LCD controller and RAM providing simple interfacing
- 61 x 15.8 mm viewing area
- 5 x 7 dot matrix format for 2.96 x 5.56 mm characters, plus cursor line
- Can display 224 different symbols
- Low power consumption (1 mA typical)
- Powerful command set and user-produced characters
- TTL and CMOS compatible
- Connector for standard 0.1-pitch pin headers

Table 5.3 16 x 2 Alphanumeric LCD Module Specifications

Pin	Symbol	Level	Function

1	V _{SS}	-	Power, GND
2	V _{DD}	-	Power, 5V
3	V ₀	-	Power, for LCD Drive
4	RS	H/L	Register Select H: Data Input L: Instruction Input
5	R/W	H/L	H: Data Read (LCD->MPU) L: Data Write (MPU->LCD)
6	E	H,H->L	Enable
7-14	DB0-DB7	H/L	Data Bus; Software selectable 4- or 8-bit mode
15	NC	-	NOT CONNECTED
16	NC	-	NOT CONNECTED

FEATURES:

- 5 x 8 dots with cursor
- Built-in controller (KS 0066 or Equivalent)
- + 5V power supply (Also available for + 3V)
- 1/16 duty cycle
- B/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED)
- N.V. optional for + 3V power supply

Data can be placed at any location on the LCD. For 16×1 LCD, the address locations are:

Table 5.4 Address locations for a 1x16 line LCD

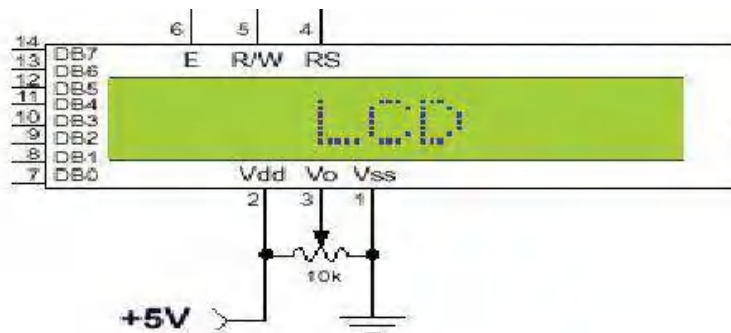
POSITION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ADDRESS	LINE1	00	01	02	03	04	05	06	07	40	41	42	43	44	45	46	47

Even limited to character-based modules, there is still a wide variety of shapes and sizes available. Line lengths of 8,16,20,24,32 and 40 characters are all standard, in one, two and four line versions.

Several different LC technologies exists. “supertwist” types, for example, offer Improved contrast and viewing angle over the older “twisted noematic” types. Some modules are available with back lighting, so that they can be viewed in dimly lit conditions. The back lighting may be either “electro-luminescent”, requiring a high voltage inverter circuit, or simple LED illumination.

PIN DESCRIPTION:

Most LCDs with 1 controller have 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).

**Figure 5.7.1 Pin diagram of 1x16 lines LCD****Table 5.5 Pin specifications**

PIN	SYMBOL	FUNCTION
1	Vss	Power Supply(GND)
2	Vdd	Power Supply(+5V)
3	Vo	Contrast Adjust
4	RS	Instruction/Data Register Select
5	R/W	Data Bus Line
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15	A	Power Supply for LED B/L(+)
16	K	Power Supply for LED B/L(-)

CONTROL LINES:

EN: Line is called "Enable." This control line is used to tell the LCD that you are sending it data. To send data to the LCD, your program should make sure this line is low (0) and then set the other two control lines and/or put data on the data bus. When the other lines are completely ready, bring EN high (1) and wait for the minimum amount of time required by the LCD datasheet (this varies from LCD to LCD), and end by bringing it low (0) again.

RS: Line is the "Register Select" line. When RS is low (0), the data is to be treated as a command or special instruction (such as clear screen, position cursor, etc.). When RS is high (1), the data being sent is text data which should be displayed on the screen. For example, to display the letter "T" on the screen you would set RS high.

RW: Line is the "Read/Write" control line. When RW is low (0), the information on the data bus is being written to the LCD. When RW is high (1), the program is effectively querying (or reading) the LCD. Only one instruction ("Get LCD status") is a read command. All others are write commands, so RW will almost always be low. Finally, the data bus consists of 4 or 8 lines (depending on the mode of operation selected by the user). In the case of an 8-bit data bus, the lines are referred to as DB0, DB1, DB2, DB3, DB4, DB5, DB6, and DB7.

Logic status on control lines:



- E - 0 Access to LCD disabled
- 1 Access to LCD enabled
- R/W - 0 Writing data to LCD
- 1 Reading data from LCD
- RS - 0 Instructions
 - 1 Character

Writing data to the LCD:

- 1) Set R/W bit to low
- 2) Set RS bit to logic 0 or 1 (instruction or character)
- 3) Set data to data lines (if it is writing)
- 4) Set E line to high
- 5) Set E line to low

Read data from data lines (if it is reading) on LCD: 1)

- Set R/W bit to high
- 2) Set RS bit to logic 0 or 1 (instruction or character)
 - 3) Set data to data lines (if it is writing)
 - 4) Set E line to high
 - 5) Set E line to low

Entering Text:

First, a little tip: it is manually a lot easier to enter characters and commands in hexadecimal rather than binary (although, of course, you will need to translate commands from binary couple of sub-miniature hexadecimal rotary switches is a simple matter, although a little bit into hex so that you know which bits you are setting). Replacing the d.i.l. switch pack with a of re-wiring is necessary.

LCD Commands:

There are some present commands instructions in LCD, which we need to send to LCD through some microcontroller. Some important command instructions are given below:

Table 5.6 Commands

Hex Code	Command to LCD Instruction Register
0F	LCD ON, cursor ON

01	Clear display screen
02	Return home
04	Decrement cursor (shift cursor to left)
06	Increment cursor (shift cursor to right)
05	Shift display right
07	Shift display left
0E	Display ON, cursor blinking
80	Force cursor to beginning of first line
C0	Force cursor to beginning of second line
38	2 lines and 5×7 matrix
83	Cursor line 1 position 3
3C	Activate second line
08	Display OFF, cursor OFF
C1	Jump to second line, position 1
OC	Display ON, cursor OFF
C1	Jump to second line, position 1
C2	Jump to second line, position 2

5.8 HC-SR04 Ultrasonic Sensor

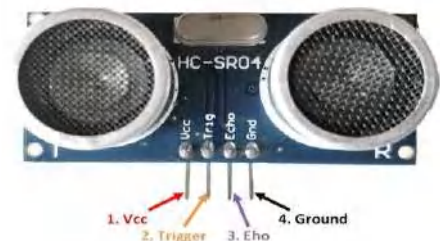


Figure 5.8 Ultrasonic
Table 5.7 Ultrasonic Sensor Pin Configuration



Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

HC-SR04 Sensor Features

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: $<15^\circ$
- Operating Current: $<15\text{mA}$
- Operating Frequency: 40Hz

HC-SR04 Ultrasonic Sensor - Working

As shown above the **HC-SR04 Ultrasonic (US) sensor** is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that

Distance = Speed × Time

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module.

Now, to calculate the distance using the above formulae, we should know the Speed and time. Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

Microphone Basics

Microphones are used wherever sound needs to be picked up and converted into an electrical format.

Microphones are an essential part of any audio recording system. The microphone picks up the sound and converts it into electrical energy that can then be processed by electronic amplifiers and audio processing systems.



Fig 5.8 Typical moving coil / dynamic microphone

Microphones come in all shapes and sizes. Also different types of microphone may use different technologies. These different types of microphone have different properties, and therefore a knowledge of the various forms of microphone will enable the best microphone type to be chosen for a given application.

In terms of their technology, most microphones use electromagnetic induction (dynamic microphones), capacitance change (condenser microphones) or piezoelectricity (crystal or ceramic microphones) to produce an electrical signal from air pressure variations.



Microphones produce very small output signal levels. Accordingly, they need to be connected to a preamplifier before the signal can be recorded or reproduced.

A knowledge of the different types of microphone also enables the way it is used to play to its strengths. So even if you are not a techie, it helps to know a little about them to use them to their best.

Microphone parameters

When choosing a microphone for any given application, it is necessary to take account of the various attributes, specifications and performance parameters that it has.

Some of the key parameters for microphones include:

- Fidelity
- Sensitivity
- Frequency response
- Directional attributes
- Robustness
- Cost
- Convenience of use
- Appearance

The importance of the different microphone parameters will depend upon the application. Before making a choice of any given microphone it is necessary to decide what is important.

Microphone features

When looking at the optimum microphone for any given application, there are many different parameters and issues to consider. Some of the issues will include the following features:



1. **Type of microphone:** There are very many different types of microphone that are available. Each type has its own characteristics and is best suited for particular applications. *Read more about the **different types of microphone.***
2. **Directional characteristics:** Microphones can have different sensitivity levels in different directions. The microphone directional characteristics are important in making sure the microphone used can pick up all the sounds that are needed. Accordingly the directional capabilities are of great importance and microphones are often characterized by them. *Read more about the **microphone directionality.***
3. **Diaphragm size:** Microphones with different diaphragm sizes have different characteristics and are therefore often used in different applications.

Microphone history highlights

The development of the microphone has taken many years. Many improvements and developments have always been taking place, but some of the major highlights and milestones in the history of the microphone are summarized below.

CHAPTER 6

RESULTS

SCHEMATIC DIAGRAM

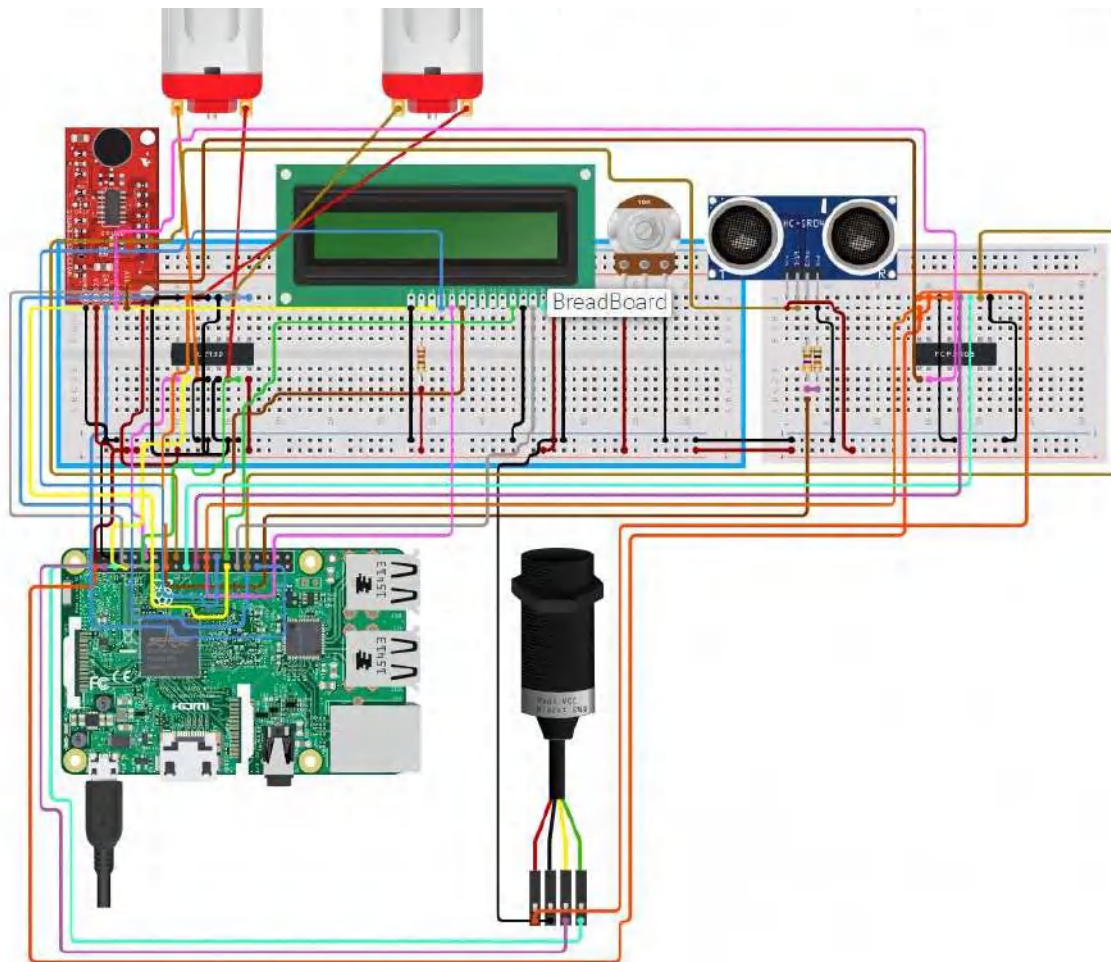
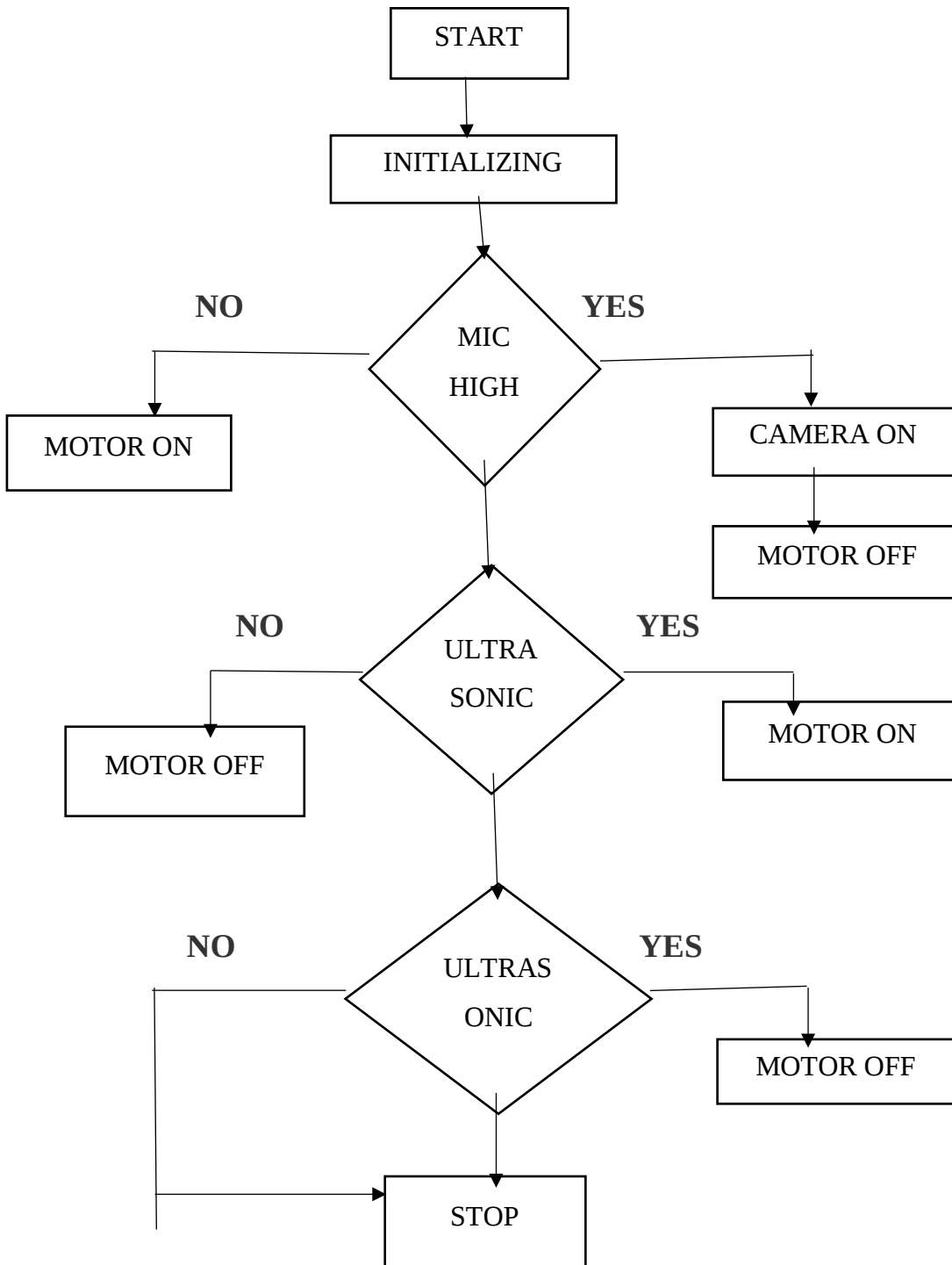


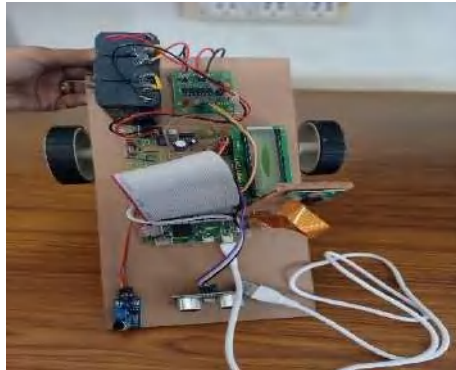
Fig 6.1 Schematic Diagram of IoT robot

Working:

The system is designed around Raspberry pi. Here the sound sensor is used to sense the sound, the source of the sound being the victim. Raspberry pi is installed with the night vision camera which helps the system to go for automation and help to find the human or any problem detected using the sound sensor and according to the sound produced it automatically goes to that area and capture the image and send it to the user using IOT technology.

FLOWCHART

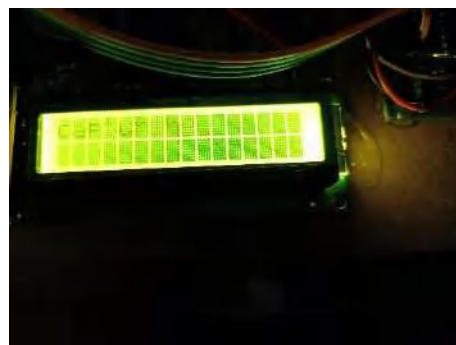
If the mic is high, then camera on and motor of. Mic is low then motor on. When ultrasonic sensor ==100 then motor on otherwise motor off. When ultrasonic ==50 then motor off.



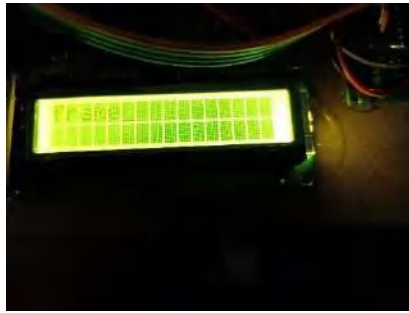
The figure shows the working prototype of the IoT robot kit



. The figure shows that the LCD will be provide a output incase of any obstacle hinder the path of the robot.



In the event of any obstacle hindering the path of the robot the embedded camera starts capturing the images of the obstacle.



During the image capturing process, the obstacle is framed and the same is displayed in the LCD.



Fig

The image will then be captured using the camera.

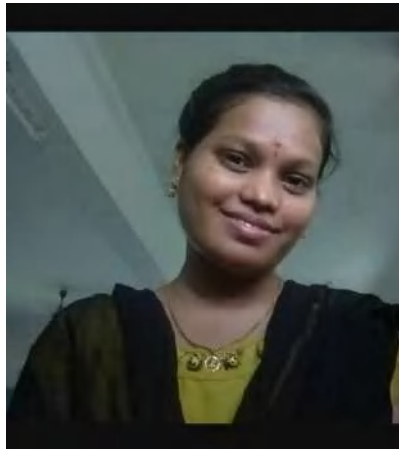


Fig

The captured image is read.



Following the process of image being read, the image is saved and then uploaded.



Also if any sound waves are produced of a certain range of frequency near the camera the sensory bulb will blink followed by capturing of the image in-front of the camera.



CHAPTER 7

CONCLUSION AND FUTURE SCOPE

A wide range of area surveillance is done using the night vision camera fitted on the rover and also automatic system when the sound is detected robot will follow the particular path and go to that spotted area and capture the area and send to police station server using IoT. This concept is an automatic smart way to patrolling overnight to save women.

Four algorithms namely Adaboost, Bagging, Stacking, Enhanced Reweight mechanism in the ensemble were considered in this paper. Results show that the new ensemble algorithm gives better accuracy in most cases. 95% accuracy is given by the new ensemble algorithm to correctly predict the crimes.



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WOMEN SAFETY NIGHT PATROLLING IOT ROBOT

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ABSTRACT

Nowadays Women Safety is the biggest concern in many parts of the world. There is still a fear in alone areas for women as well as men. So here we propose a security patrolling robot using Raspberry PI. The system uses cameras and mic mounted on robotic vehicle for securing any premises. The robotic vehicle moves at particular path and is equipped with camera and sound sensors. It uses a predefined line to follow its path while patrolling. It stops at particular points and moves to next points if sound is detected. The system uses IR based path following system for patrolling assigned area. It monitors each area to detect any problem using combination of two HD cameras. It has the ability to monitor sound in the premises. Robot hears Any sound after area is quite and it starts moving towards the sound on its predefined path. It then scans the area using its camera to detect any human faces detected. It captures and starts transmitting the images of the situation immediately to the IOT website. Here we use IOT gecko for receiving transmitted images and displaying them to user with alert sounds. Thus we put forward a fully autonomous security robot that operates tirelessly and patrols large areas on its own to secure the facility.

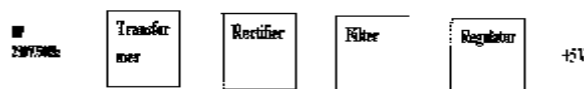
I. INTRODUCTION

Women are adept at mobilizing diverse groups for a common cause. They often work across ethnic, religious, political, and cultural divides to promote peace. We are all aware of importance of women's safety, but we must realize that they should be properly protected. Women are not as physically strong as men, in an emergency situation a helping hand would be a relief for them. The best way to minimize your chances of becoming a victim of violent

crime (robbery, sexual assault, rape, domestic violence) is to identify and call on resources to help them out of dangerous situations. Whether it is an immediate trouble or they get separated from friends during a night out and don't know how to get home, having these applications can reduce the risk and bring assistance when needed. Although several were originally developed for students to reduce the risk of sexual assault on campus, they are suitable for all women in the light of recent outrage in Delhi which shook the nation and woke us to the safety issues for our daughters, people are gearing up in different ways to fight back. The status of women in India has gone through many great changes over the past few millennia. In modern India, women continue to face social challenges and are often victims of abuse and violent crimes and, according to a global poll conducted by

Thomson Reuters, India is the "fourth most dangerous country" in the world for women, and the worst country for women among the G20 countries. This project focuses on a security robot that is designed solely to serve the purpose of providing security and safety to women so that they never feel helpless while facing such social challenges. The Delhi "Nirbhaya" case that triggered the whole nation was the greatest motivation for this project. It was high time women needed a change.

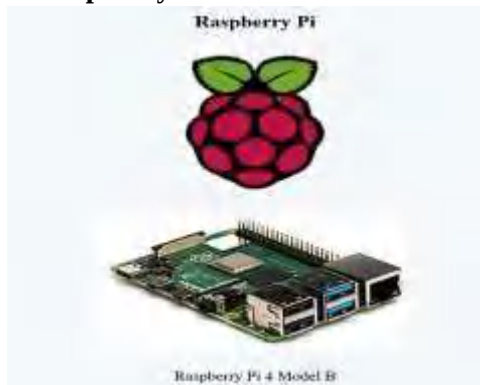
II. POWER SUPPLY



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Figure: Power Supply III. HARDWARE

3.1 Raspberry Pi



When booting, the time defaults to being set over the network using the Network Time Protocol (NTP). The source of time information can be another computer on the local network that *does* have a real-time clock, or to a NTP server on the internet. If no network connection is available, the time may be set manually or configured to assume that no time passed during the shutdown. In the latter case, the time is monotonic (files saved later in time always have later timestamps) but may be considerably earlier than the actual time. For systems that require a built-in realtime clock, a number of small, low-cost add-on boards with real-time clocks are available.[87][88]

The RP2040 microcontroller has a builtin real-time clock but this can not be set automatically without some form of user entry or network facility being added.

Various operating systems for the Raspberry Pi can be installed on a MicroSD, MiniSD or SD card, depending on the board and available adapters; seen here is the MicroSD slot located on the bottom of a Raspberry Pi 2 board.

3.4 L293D

L293D is basically a high current dual motor driver/controller Integrated Circuit (IC). It is able to drive load having current up to 1A at the voltage ranging from 4.5V to 36V. Motor driver usually act as current amplifier because they receive a low current signal as an input and provides high current signal at the output.

Motors usually operates on this higher current. L-293D has to builtin H-Bridge driver circuits and is able to control two DC motors at a time in both clockwise and counter clockwise

direction. It has two enable pins and they should be kept high in order to control the motor. By changing the polarity of applied signal motor can be rotated in either clockwise or counter clockwise direction. If L 293D enable pin is high, its corresponding driver will provide the desired out. If the enable pin is low, there will be no output. L-293D has different features including internal ESD protection, large voltage supply range, large output current per channel, high noise immunity input etc. L 293D plays a vital role in electronics era and has several different applications e.g relay drivers, DC motor drivers, stepping motor drivers etc. The further detail about L 293D motor driver/controller will be given later in this tutorial.

L293D Motor Driver



3.5 L293D Pinout

- Pinout diagram of any device presents the pins configuration through a completely labelled diagram.
- L293D pinout diagram is shown in the figure given below.



Figure L293D

3.6 DC Motors

The brushed DC motor is one of the earliest motor designs. Today, it is the motor of

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choice in the majority of variable speed and torque control applications.

Advantages

- Easy to understand design
- Easy to control speed
- Easy to control torque
- Simple, cheap drive design

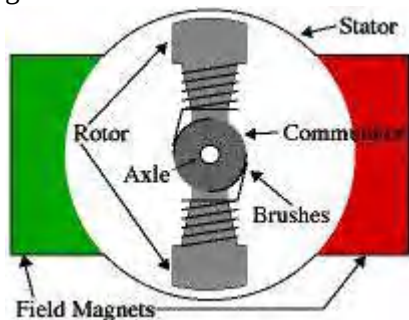
Easy to control speed

Controlling the speed of a brushed DC motor is simple. The higher the armature voltage, the faster the rotation. This relationship is linear to the motor's maximum speed. The maximum armature voltage which corresponds to a motor's rated speed (these motors are usually given a rated speed and a maximum speed, such as 1750/2000 rpm) are available in certain standard voltages, which roughly increase in conjunction with horsepower. Thus, the smallest industrial motors are rated 90 VDC and 180 VDC. Larger units are rated at 250 VDC and sometimes higher.

Specialty motors for use in mobile applications are rated 12, 24, or 48 VDC. Other tiny motors may be rated 5 VDC.

WORKING OF DC MOTOR

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.



3.7 Liquid Cristal Display

A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other.

A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to a controller is an LCD display. Some of the most common LCDs connected to the controllers are 16X1, 16x2 and 20x2 displays. This means 16 characters per line by 1 line 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively.

HC-SR04 Ultrasonic Sensor

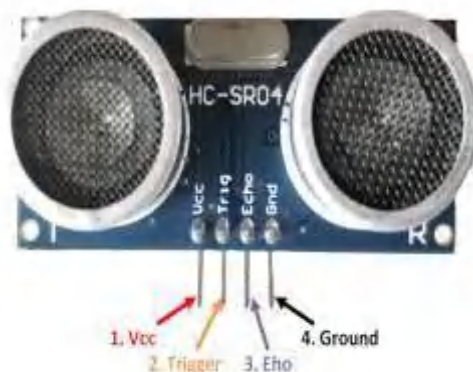
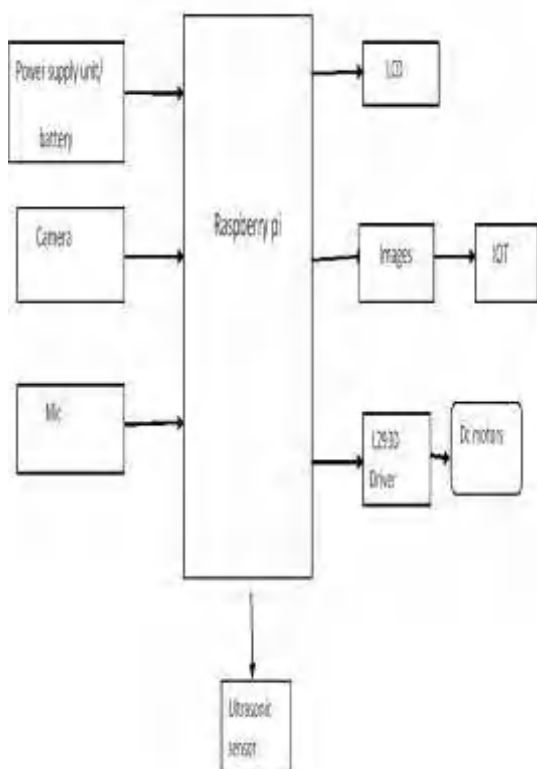


Figure Ultrasonic

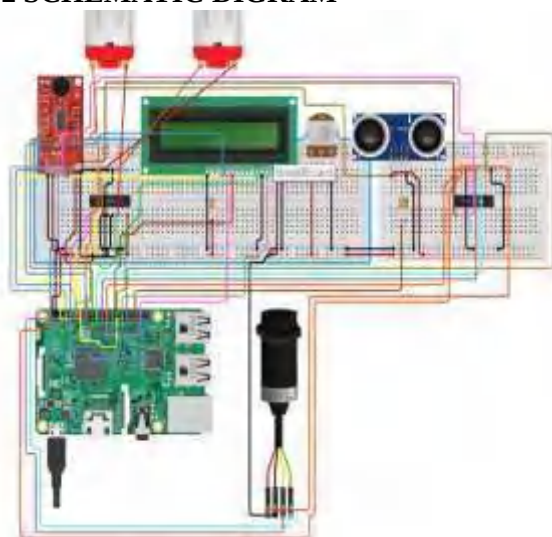
IV.RESULT:

4.1BLOCK DIAGRAM

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4.2 SCHEMATIC DIGRAM



4.3 FLOWCHART

WORKING

If the mic is high then camera on and motor of .Mic is low then motor on. When ultrasonic sensor ==100 then motor on otherwise motor off. When ultrasonic ==50 then motor off.

V. CONCLUSION

A wide range of area surveillance is done using the night vision camera fitted on the rover and also automatic system when the sound is detected robot will follow the particular path and go to that spotted area and capture the area and send to police station server using IoT. This concept is an automatic smart way to patrolling overnight to save women.

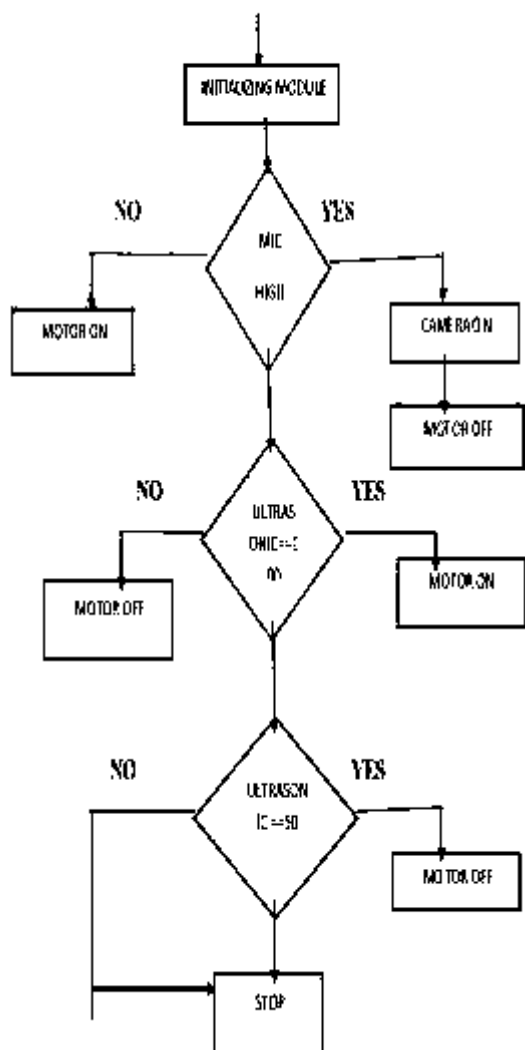
Four algorithms namely Adaboost, Bagging,

the ensemble were considered in this paper.

Results show that the new ensemble algorithm

Stacking, Enhanced Reweight mechanism in

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gives better accuracy in most cases. 95% accuracy is given by the new ensemble START algorithm to correctly predict the crimes.

REFERENCE:

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,: 'Implementation of Spy Robot for A Surveillance System using Internet protocol of Raspberry Pi', published in 2017 International conference on recent trends in Electronics information and communication technology.
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8. Cheng Tang, Qunqun Xie, Guolai Jiang, Yongsheng Ou,: 'Road detection at night based on a planar reflection model', published in IEEE International Conference on Information and Automation (ICIA) in 2013.
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10. Zhonghuna Han and Tingting Li,: 'Research Sound Source Localization and Real-Time Facial Expression Recognition for Security Robot', published in Journal of Physical Conference in 2020

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Authored by

Lakshmi Naga Srivani Gujjani

From

SVR ENGINEERING COLLEGE, NANDYAL

Has been published in

JES JOURNAL, VOLUME 12, ISSUE 07, JULY- 2021

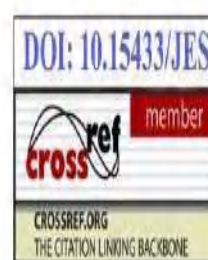


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SVR ENGINEERING COLLEGE,NANDYAL,ECE II-II MID EXAL CONSOLIDATED MARKS R15 REGULATIONS										
S.NO.	ROLL NUMBER	1-(15A54402) MATHEMATICS-IV	2-(15A04401) ELECTRONIC CIRCUIT ANALYSIS	3-(15A04402) ANALOG COMMUNICATION SYSTEMS	4-(15A04403) ELECTROMAGNETIC THEORY AND TRANSMISSION LINES	5-(15A05201) DATA STRUCTURES	6-(15A02303) CONTROL SYSTEMS ENGINEERING	7-(15A04404) ELECTRONIC CIRCUIT ANALYSIS LAB	8-(15A04405) ANALOG COMMUNICATION SYSTEMS LAB	Grand Total
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3	18AM1A0401	24	23	22	19	24	17	25	22	176
4	18AM1A0402	27	28	27	29	28	27	27	28	221
5	18AM1A0403	21	16	22	22	21	15	24	22	163
6	18AM1A0404	19	26	23	26	24	16	26	27	187
7	18AM1A0405	16	15	21	19	15	15	16	24	141
8	18AM1A0406	25	25	26	29	27	15	27	26	200
9	18AM1A0407	16	19	25	17	24	16	24	24	165
10	18AM1A0408	24	19	23	24	21	20	25	24	180
11	18AM1A0409	29	29	26	28	28	24	27	27	218
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13	18AM1A0411	21	26	21	21	25	15	24	24	177
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15	18AM1A0413	23	24	22	25	25	20	26	27	192
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18	18AM1A0416	26	26	22	24	26	20	25	26	195
19	18AM1A0417	27	28	27	29	26	25	28	28	218
20	18AM1A0418	18	26	23	23	20	16	25	24	175
21	18AM1A0419	19	26	27	26	23	20	27	27	195
22	18AM1A0420	21	23	24	23	25	24	25	25	190
23	18AM1A0421	20	21	21	23	23	15	27	28	178
24	18AM1A0423	30	29	25	26	28	24	27	27	216
25	18AM1A0424	16	17	20	17	20	15	15	24	144
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72	19AM5A0406	22	21	23	16	23	16	24	25	170

SVR ENGINEERING

Class : III yr - I Sem

ATTENDANCE

REGIST

Branch : ECE

Sl. No.	Roll No.	NAME	YEAR	19	19	19	19	19	19	19	19	19	19	19	19	19	19	
			MONTH	7	7	7	8	8	8	9	9	9	10	10	10	10	10	10
			DAY	12	29	26	2	9	30	6	20	27	4	11	18	25		
				3	6	9	12	15	18	21	24	27	30	33	36	39	42	
	17AMIA0 433	Kiran Kumar B	A	3	6	9	12	15	18	21	24	27	A	30	33			
	434	Lakshmi Manasa G	3	6	9	12	15	18	21	24	27	30	33	36	39			
	435	Lakshmi Naga SriVani G	3	6	9	12	15	18	21	24	27	30	33	36	39			
36 436	437	Lalitha Katta	3	6	9	12	15	18	21	24	27	30	33	36	39			
	438	Leelarani. Mukkamulla	3	6	9	12	15	18	21	24	27	30	33	36	39			
	439	Madhavi Latha. Tapa	3	6	9	12	15	18	21	24	27	30	33	36	39			
	440	Mahalakshmi. Y	3	6	9	12	15	18	21	A	24	27	30	33	36			
	441	MastanVali k	3	6	9	12	15	18	21	A	24	27	30	33	36			
	442	Mohammad Rafi S	A	3	6	9	A	12	15	18	21	A	24	27	30			
	443	Mohan. Dunnapothula	3	A	6	9	12	15	18	21	24	27	30	33	36			
	444	Mouli Basha. Dudekula	A	A	3	6	9	12	A	A	15	A	A	A	A			
	445	Murali Konde	3	6	9	12	15	18	A	21	24	27	30	33	36			
	446	Naga Sudharani. T	3	6	9	12	15	18	21	24	27	30	33	36	39			
	447	Naga Vardhan Reddy. B	3	A	6	9	12	15	18	21	24	A	A	27	30			
	448	Niharika. Tapasi	3	6	9	12	15	18	21	24	27	30	33	36	39			
	449	Noor Khaja. Shaik. G	3	6	9	12	15	18	21	24	27	30	33	36	39			
	450	Noor Basha Poluru	3	A	6	9	A	12	15	18	21	24	27	A	30			
	451	Pedda Nagendra. C	3	A	6	9	12	15	18	A	21	24	27	30	33			
	452	Pranathi. Illuru	3	6	9	12	15	18	21	24	27	30	33	36	39			
	453	Praveen Kumar. M	3	6	9	12	15	18	21	24	27	30	33	36	39			
	454	Priyanka. Mogili	3	A	6	9	12	15	A	18	A	21	24	27	30			
	455	Radha Krishna Reddy K	3	6	9	12	A	A	15	18	21	A	24	27	30			
	456	Rama Tulasieswar Reddy G	A	A	3	6	A	9	A	12	A	15	18	21	24			
	457	Ramya. Malleshwar	A	3	6	9	12	15	18	21	24	27	30	33	36			
	458	Sai Sindhu Ahonekula	3	6	9	12	15	18	21	24	27	30	33	36	39			
	459	Sai Swapnith. L	A	3	6	A	9	12	A	15	A	A	18	21	24			
	460	Sardar Hussain H	3	6	9	12	15	18	21	A	24	A	27	30	33			
	436	Lakshmi Prasanna Mata	3	6	9	12	15	18	21	24	27	30	33	36	39			

Record Marks	Final Marks
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ACADAMIC YEAR :2020-2021

IV-B.Tech,II-Semester--PROJECT REVIEW AVERAGE MARKS

B.No.	PROJECT GUIDE	PROJECT TITLE	ROLL NUMBER	NAME OF THE STUDENT	PRC-1	PRC-2	PRC-3	TOTAL	AVG
1	P. MALLIKARJUNA Assistant Professor	BROTH CULTURE ACIDITY CONTROL SYSTEM ON NF1-BASED HYDROPHONIC PLANTS	17AM1A0402	ALFINA SHAIK	59	58	60	177	59
			17AM1A0492	YOGESWAR PASUPULA	54	52	53	159	53
			18AM5A0406	LAKSHMIMALLISWARI DASARI	56	57	55	168	56
2	G. RAJESH KRISHNA Assistant Professor	DESIGN OF INTELLIGENT PAPER COUNTING SYSTEM BASED ON KNN ALGORITHM	17AM1A0449	HANIFA SHAIK	60	58	59	177	59
			17AM1A0485	VEERA SATHI LATHA SOLIGE	59	58	57	174	58
			17AM1A0411	CHANDRA MOULI ACHARI KAMMARA	58	57	56	171	57
3	D. ASHOK KUMAR Assistant Professor	DESIGN AND IMPLEMENTATION OF SMART MITTEN FOR DEAF AND DUMB PEOPLE	18AM5A0403	BHAVYA SREE RAJA	60	59	58	177	59
			17AM1A0451	PEDDA NAGENDRA CHINTHA	51	53	52	156	52
			17AM1A0424	HARSHITHA MUDIYAM	49	50	51	150	50
4	K. NAGENDRA KUMAR Assistant Professor	CLOUD BASED REAL TIME HUMAN ACTIVITY TRACKING SYSTEM USING WEARABLE SENSOR	17AM1A0405	ASMA SHAIK	58	59	60	177	59
			17AM1A0463	SHAHIN SHAIK	58	57	59	174	58
			17AM1A0472	SRIVIDHYA CHINNA BUJUTI	57	55	56	168	56
5	K. K. VARA LAXMI Associate Professor	SMART LOCKER WITH WIRELESS CONTROL USING IOT TECHNOLOGY	17AM1A0404	ANUSHA TAPASI	59	58	60	177	59
			17AM1A0409	BEEBI DUDEKULA	51	50	49	150	50
			17AM1A0432	KAMESWARI RAGABOINA	59	58	57	174	58
6	P. JHANSI Assistant Professor	COGNATE POSITION AND STATIC DETECTION OF HYDRAULIC ENDORSE BASED ON PARTICLE SWARM	17AM1A0460	SARDARIUSSAIN HANUMADGUNDAM	57	59	57	173	58
			17AM1A0482	VAMSI KRISHNA BOYA KOMMASANI	55	54	53	162	54
			17AM1A0443	MOHAN DUNNAPOTHULA	56	55	57	168	56
7	Dr. G. LAKSHMI NARAYANA Professor	SMART SECURITY SYSTEM WITH SPEECH RECOGNITION USING IOT TECHNOLOGY	18AM5A0410	SRAVANALAKSHMI MARAM	60	59	58	177	59
			17AM1A0489	VINOD KUMAR REDDY TOKALA	54	52	53	159	53
			17AM1A0434	LAKSHMI MANASA GUDA	57	56	55	168	56

8	S MOHAN DAS Associate Professor	ACCIDENT DETECTION AND REGULATION THROUGH INTERNET OF VEHICLES BY USING VANET	17AM1A0437	LALITHA KATTA	56	57	58	171	57
			17AM1A0417	GURUKUMAR DUDEKULA	53	54	55	162	54
			17AM1A0433	KIRAN KUMAR BARIGA	55	56	57	168	56
9	B. PREM KUMAR Assistant Professor	IOT TECHNOLOGY BASED SMART VIAL	17AM1A0408	BABU RAYHAN SHAIK	59	58	60	177	59
			17AM1A0476	SUMALATHA BOINA	58	57	59	174	58
			17AM1A0456	RAMA TULASIESWAR REDDY GUNTI	51	53	52	156	52
10	C. SUDHAKAR BABU Assistant Professor	IOT BASED ENERGY TRACKING AND BILL ESTIMATION SYSTEM	17AM1A0448	NIHARIKA TAPASI	58	57	59	174	58
			18AM5A0409	SALMAN SHAIK	56	57	58	171	57
			17AM1A0466	SINDHU PRIYA CHAKALI	53	55	54	162	54
11	Mr Y RAMA MOHAN REDDY Assistant Professor	IOT TECHNOLOGY BASED HEALTH MONITORING AND MAINTAINING SYSTEM	17AM1A0481	USHA RANI KOLLI	58	57	59	174	58
			18AM5A0407	PRAVIEN KUMAR NULAKACHANDANAM	54	56	55	165	55
			17F21A0467	MOHAMMED UMAR S	53	52	54	159	53
12	P. LOKESHWARA REDDY Assistant Professor	IOT BASED ON TRAFFIC SIGNAL CONTROLLING	17AM1A0457	RAMYA MALLEPOGU	59	57	58	174	58
			17AM1A0480	SUVEENA PEDDA YENUMULA	55	54	56	165	55
			17AM1A0439	MADHAVI LATHA TAPA	57	55	56	168	56
13	DR K. VASUDEVA REDDY Professor	AUTOMATIC SOLAR TRACKING SYSTEM WITH SELF-TEST CONSTRUCTION	17AM1A0452	PRANATHI ILLURU	57	58	59	174	58
			17AM1A0478	SURESHKUMAR NAKKA	55	53	54	162	54
			17AM1A0447	NAGAVARDHAN REDDY BATHULA	53	54	55	162	54
14	B. SIREESHA Assistant Professor	WOMEN SAFETY NIGHT PATROLLING IOT ROBOT	17AM1A0435	LAKSHMI NAGA SRIVANI GUJJANI	59	57	58	174	58
			17AM1A0486	VENKATA SATYA KOMALA ARIKATLA	56	54	55	165	55
			17AM1A0465	SHIREESHA CHILAKALURI	55	56	54	165	55
15	A. JANARDHAN REDDY Assistant Professor	AUTOMATIC WATERING SYSTEM WITH EFFICIENT SUN TRACKING SOLAR PLATE	18AM5A0402	ARUNA JYOTHI PUNUGUPATI	58	57	59	174	58
			17AM1A0473	SUBBARAYUDU BATTULA	53	54	55	162	54
			17AM1A0490	YAMUNA GIDDALURU	53	54	55	162	54
16	D. ANURADHA Associate Professor	BABY CARDLE AND HEALTH MONITORING SYSTEM USING IOT TECHNOLOGY	17AM1A0430	JYOTHI GUNTHAPATI	56	57	58	171	57
			17AM1A0441	MASTAN VALI KOTHAKOTTAM	53	54	55	162	54
			17AM1A0410	CHAITANYA DASARI	57	58	59	174	58
	G. BRAHMAIAH Assistant Professor		17AM1A0406	AVILA JOSEPH	57	58	59	174	58
			17AM1A0428	JEEVAN KUMAR KASULA	57	55	56	168	56

17		AN EFFICIENT WAY OF POWER GENERATION WITH HELP OF RENEWABLE RESOURCES	17AM1A0469	SRAVANTHI AMBATI	56	54	55	165	55
18	S HAROON RASHEED Assistant Professor	ELECTRONIC CAR DOG EQUIPMENT THAT CAN BE WIDELY USED IN NURSING HOME	17AM1A0420	HARI KISHORE NEELI	59	57	58	174	58
			17AM1A0438	HEELARANI MUKKAMALLA	56	54	55	165	54
			17AM1A0487	AYAZ AHMED TONDALADINNI	57	56	55	168	56
19	N MIDHILA Associate Professor	CROP SHIELD SYSTEM WITH IOT TECHNOLOGY SURVEILLANCE & AUTO DETECTION	17AM1A0487	VENKATA SUBBA KATYAYANI GUNTUA	58	57	59	174	58
			17AM1A0414	DIVAKAR BOYVENENI	56	54	55	165	55
			17AM1A0445	MURALI KONDE	53	52	54	159	53
20	S SREENIVASULU Assistant Professor	IOT TECHNOLOGY DRIVEN SPACE AND BUILT ENVIRONMENT	17AM1A0426	JAINAVI DHANIREDDY	58	57	59	174	58
			17AM1A0416	GOPINATH GAJULA	55	56	57	168	56
			17AM1A0470	SREENATH REDDY SANGIREDDY	56	55	57	168	56
21	P. ARIFA PARVEEN Assistant Professor	IOT TECHNOLOGY BASED TEMPERATURE & MASK SCAN ENTRY SYSTEM	17AM1A0467	SIVA SHANKAR CHALLA	57	58	59	174	58
			17AM1A0421	HARI KRISHNA G	55	53	54	162	54
			18AM5A0411	VENKATESH CHAKALI	53	52	54	159	53
22	N MID MOHASINUL HUQ Assistant Professor	PLC BASED HOME AUTOMATION USING ARM CORTEX M3 CONTROLLER	18AM5A0408	RUKSANA SAYYAD	60	58	59	177	59
			17AM1A0477	SUMALATHA CHAKALI	57	58	59	174	58
			17AM1A0449	NOOR KHAJA SHAIK GOPAVARAM	57	56	55	168	56
23	Mr. KAMIREDDY SESHIDAR Assistant Professor	INSPECTION ON COMMUNICATION INTERFERENCE AND MITIGATION USING LIFE TECHNOLOGY	17AM1A0491	YASHASWINI BORRA	58	60	59	177	59
			17AM1A0412	CHENNA KESHAVA NUKALA	58	56	57	171	57
			17AM1A0493	ZIA UL HAQ MULLA	50	51	52	153	51
24	S ARIFF HUSSAIN Associate Professor	A NEW ERA OF VEHICLE SECURITY SYSTEM	17AM1A0468	SOWJANYA MARRI	59	58	57	174	58
			17AM1A0474	SUDHA RANI MAKAM	55	56	57	168	56
			17AM1A0450	NOORBASHA PALURU	49	51	50	150	50
25	Mr. N LADAYA SANKAR REDDY Assistant Professor	WIRELESS SYSTEM FOR TRAFFIC SIGN IDENTIFICATION AND VIOLATION MONITORING SYSTEM	17AM1A0488	VINEETHA NAGIRI	58	59	60	177	59
			17AM1A0413	DHARANI AMBATI	56	57	58	171	57
			17AM1A0403	AMJAD BASHA SHAIK	46	47	48	141	47
26	D RAGHUNATHA RAO Associate Professor	COORDINATING A TRAFFIC PREEMPTION SYSTEM ON AN CRISIS VEHICLE AND AIRPORT RUNWAY SYSTEM	17AM1A0483	VASUDHA SALEBOYINA	55	56	57	168	56
			17AM1A0458	SAI SINDHU DHANEKULA	51	53	52	156	52
			17AM1A0442	MOHAMMAD RAFI SYED	56	54	55	165	55
27	Mr. D SINGA REDDY Assistant Professor	A MECHANIZED ROBOT FOR ELDER PEOPLE ALERT AND RESCUE SYSTEM	18AM5A0401	ANURADHA JANAGARI	57	58	59	174	58
			17AM1A0454	PRIYANKA MOGILI	57	58	59	174	58
			17AM1A0453	PRAYEEN KUMAR MAHANKALI	53	52	54	159	53

28	K. SWAPNA Assistant Professor	IoT TECHNOLOGY BASED SMART WITTED CONTROL SYSTEM FOR SMART PILE	17AMSA0404	JAGADEESH NANDHARJAM	55	56	57	168	56	56
			17AMIA0484	VEDHANA THI KAMMARA	58	57	56	171	57	57
29	Dr. M.M. RAGHAVENDR A Professor	INNOVATIVE LINE FOLLOWING ROBOT FOR SPERS PARALYZED PATIENT	17AMIA0415	DEEPA VENKATA KATYAN SENGU	52	51	53	156	52	52
			17AMIA0475	SUDHITHA BOINA	55	56	57	168	56	56
			17AMIA0455	RADHAKRISHNA REDDY GADDAM	52	53	54	159	53	53
			17AMIA0418	HAATHANESIMAN	50	51	52	153	51	51
30	Dr. G. LAKSHMI NARAYANA Professor	BIOMETRIC ATTENDANCE SYSTEM OVER IoT	17AMIA0425	JAGADEESH BOYANENI	57	56	58	171	57	57
			17AMIA0436	PAKSHI PRASANNA NAKA	57	58	59	174	58	58
			18AMSA0405	PAHLE RUDIN BASHA KANUDAI	54	55	53	162	54	54
31	Mr. K. NARASIMHULU Assistant Professor	AUTOMATIC DANGER DETECTION AND VOICE CONTROLLED ROBOT FOR PHYSICALLY CHALLENGED PEOPLE	17AMIA0410	MAHA LAKSHMI YATAGIRI	57	56	58	171	57	57
			17AMIA0422	HYRITHA CHAKALI	58	57	59	174	58	58
			17AMIA0459	SAL SWAPNITH LAGBETTY	48	49	50	147	49	49
			17AMIA0429	JITHENDRA RAMSETTY	53	54	55	162	54	54

PROJECT CO-ORDINATOR

MOD. ECE



Title : B.Tech III Year II Semester (R19) Regular Examinations, July/August 2022

HallTicket Number : 19AM1A0418

Student Name : CHINTHAKUNTA GANGA BHAVANI

Subject Code	Subject Name	Internal Marks	External Marks	Total Marks	Result Status	Credits	Grade
19A05604b	DATA SCIENCE	28	36	64	P	3	C
19A99501	MC CONSTITUTION OF INDIA	26	0	26	P	0	Y
19A04606	SOCIALLY RELEVANT PROJECT	47	0	47	P	0.5	Y
19A52602b	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	25	26	51	P	3	D
19A04605e	PRINCIPLES & TECHNIQUES OF MODERN RADAR SYSTEMS	28	32	60	P	3	C
19A04602P	DIGITAL SIGNAL PROCESSING LAB	29	67	96	P	1.5	S
19A04607	COMPREHENSIVE ONLINE EXAMINATION	65	0	65	P	0	Y
19A04601P	MICROPROCESSORS & MICROCONTROLLERS LAB	27	65	92	P	1.5	S
19A04603	DIGITAL SYSTEM DESIGN THROUGH VHDL	29	28	57	P	3	D
19A04602T	DIGITAL SIGNAL PROCESSING	29	25	54	P	3	D
19A04601T	MICROPROCESSORS & MICROCONTROLLERS	28	34	62	P	3	C



Title : B.Tech III Year II Semester (R19) Regular Examinations, July/August 2022

HallTicket Number : **19AM1A0450**
Student Name : **SANKEPALLI RAJINI**

Subject Code	Subject Name	Internal Marks	External Marks	Total Marks	Result Status	Credits	Grade
19A04602P	DIGITAL SIGNAL PROCESSING LAB	29	68	97	P	1.5	S
19A04607	COMPREHENSIVE ONLINE EXAMINATION	73	0	73	P	0	Y
19A52602b	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	29	31	60	P	3	C
19A04601P	MICROPROCESSORS & MICROCONTROLLERS LAB	30	68	98	P	1.5	S
19A04601T	MICROPROCESSORS & MICROCONTROLLERS	28	54	82	P	3	A
19A04602T	DIGITAL SIGNAL PROCESSING	30	39	69	P	3	C
19A99501	MC CONSTITUTION OF INDIA	29	0	29	P	0	Y
19A04606	SOCIALLY RELEVANT PROJECT	49	0	49	P	0.5	Y
19A04605e	PRINCIPLES & TECHNIQUES OF MODERN RADAR SYSTEMS	30	37	67	P	3	C
19A04603	DIGITAL SYSTEM DESIGN THROUGH VHDL	30	34	64	P	3	C
19A05604b	DATA SCIENCE	28	34	62	P	3	C