

STUDENT HAND BOOK

(4-2)

A.Y:2024-25

INDEX

S.NO	CONTENTS	PAGE NO
1	Vision, Mission, PEOs & Quality Policy of the Department	1
2	Program Outcomes, Program Specific Outcomes	2
3	A Bird's Eye view about the Institution	4
4	Department Profile	5
5	Academic regulations R20 for B. TECH regular	6
6	Academic regulations R20 for B. TECH (LATERAL ENTRY SCHEME)	42
7	Academic Calendar by JNTUH	51
8	Department Event Planner A.Y 2023-2024	52
9	List of Subjects/ Labs	53-90

Vision of the Institute

To be recognized as a premier institution in offering the value based and futuristic quality technical education to meet the technological need of the society.

Mission of the the Institute

- To impart value quality technical education through innovative teaching and learning methods.
- To continuously produce employable technical graduates with advanced technical skills to meet the current and future technological need of the society.
- To prepare the graduate for high learning with emphasis on academic and industrial research

Vision of the Department

To promote excellence in technical education and scientific research in electronics and communication engineering for the benefit of society.

Mission of the Department

- To impart excellent technical education with state of art facilities inculcating values and lifelong learning attitude.
- To develop core competence in our students imbibing professional ethics and team spirit.
- To encourage research benefiting society through higher learning

PEOs:

PEO 1: Establish themselves as successful professionals in their career and higher education in the field of Electronics & Communication Engineering and allied domains through rigorous quality education.

PEO 2: Develop Professionalism, Ethical values, Excellent Leadership qualities, Communication Skills and teamwork in their Professional front and adapt to current trends by engaging in lifelong learning

PEO 3: Apply the acquired knowledge & skills to develop novel technology and products for solving real life problems those are economically feasible and socially relevant

PEO 4: To prepare the graduates for developing administrative acumen, to adapt diversified and multidisciplinary platforms to compete globally.

Quality Policy

Our quality policy is to continuously strive for over-all development of the department and the students. Our policy is to provide best inputs to the students and to develop them to imbibe the spirit of professionalism, dedication & commitment.

Dress Code

We encourage our students to be formally dressed on and off campus. This nurtures the feeling of equality and belongings among the students fraternity.

All students are required to carry Photo Identity card at all the time while in the campus

POs:

- PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
- PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for

i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PSOs:

- Ability to apply concepts of Electronics & Communication Engineering to associated research areas of electronics, communication, signal processing, VLSI, Embedded systems
- Ability to design, analyze and simulate a variety of Electronics & Communication functional elements using hardware and software tools along with analytic skills

A Bird's Eye view about the Institution

CMR Engineering College, popularly known as CMREC is the brain child of the clairvoyant CH.Narasihma Reddy. CMR Engineering College is one of the best engineering Colleges for aspiring engineering students. It is one of the newly established Colleges by CMR Engineering Educational Society. CMR Engineering College was established in 2010 in 10 Acres and built up area of 4,785.78 Sq.m. with a single - minded aim to provide a perfect platform to students in the field of Engineering,

Technology for their academic and overall personality development. The college has a very good academic activity which focuses for the campus placement.

The college is approved by the All India Council for Technical Education, New Delhi and is affiliated to JNT University Hyderabad. The CMREC is offering the three under graduate courses in ECE, CSE and MECH, and post graduate course in ECE and CSE.

Today, CMREC has grown in leaps and bounds and it is no wonder that CMREC has become cynosure of the eyes of many, hankering for the distinguished centre of technological learning.

Discipline, Character and Education are the three tenets for which CMREC stands, is certainly the haven where values blend seamlessly to churn out engineers for future.

- Collaborating with Institutions and Industries.
- Promoting research and development programme for the growth of economy.
- Disseminating technical knowledge in the region by continuing education programmes.
- Aiming at continual improvement of all round development of student

Department Profile

The Department of Electronics and Communication engineering of CMR Engineering College was established in the academic year 2010-11 with an annual intake of 120. The intake was increased to 180 from the academic year 2012-13 and later the intake was increased to 240 from the academic year 2013-14. In addition to this intake, the Department has 20% lateral entry students at II B.Tech level.

M.Tech programme was started with 24 intake in the specialization of Embedded Systems from the year 2013-14 and VLSI System Design from the year 2014-15.

The B.Tech (ECE) program is duly approved by the AICTE and Government of Telangana and affiliated to Jawaharlal Nehru Technological University (JNTUH), Hyderabad. Three batches have graduated so far.

Department have 56 faculty and are members of professional bodies like ISTE, IEEE, IETE. Some of the students are the members of IETE student forum and IEEE student branch of the existing Department. A technical association (ECMRON) of ECE has been formed by the senior students of the department for the benefits of students to impart additional knowledge in the field of E&C Engineering apart from prescribed curriculum.

The Department has well equipped state of art laboratories to gain good knowledge and technical skills in the field of Electronics, Communication, Microwave, VLSI, Digital Signal Processing & Microprocessors & Microcontrollers. The Department periodically organizes seminars, symposia, workshops and guest lectures for the benefit of both the students and the faculty.

Established: 2010 EAMCET Code: CMRN

Academic Regulations, Course Structure and Detailed Syllabus under Autonomous Status

BACHELOR OF TECHNOLOGY (B.TECH.)

(CMREC – R-20 Regulations)

(Applicable for the batch admitted from 2020-2021)

PRELIMINARY DEFINITIONS AND NOMENCLATURES

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government of Telangana.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and supplementary semester.

Branch: Means specialization in a program like B.Tech. degree program in Electronics and communication Engineering, B.Tech degree program in Computer Science and Engineering, etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

Commission: Means University Grants Commission (UGC), New Delhi.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Continuous Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial/lab hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Dropping from Semester: Student who does not want to register for any semester can apply in writing in prescribed format before the commencement of that semester.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

Honors: An Honors degree typically refers to a higher level of academic achievement at an undergraduate level.

Institute: Means CMR Engineering, Hyderabad unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOC courses inculcate the habit of self- learning. MOOC courses would be additional choices in all the elective group courses.

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech. degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, UG degree program: Bachelor of Technology (B.Tech.) and PG degree program: Master of Technology (M.Tech.).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-Appearing: A student can reappear only in the semester end examination for theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a program.

Regulations: The regulations, common to all B.Tech. programs offered by Institute, are designated as – CMREC Regulations – R-20 and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. Odd semester commences usually in July and even semester in December of every year.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, is an affiliating University.

Withdraw from a Course: Withdrawing from a course means that a student can drop from a course within the first two weeks of odd or even semester. However, he / she can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

FOREWORD

The autonomy is conferred to CMR Engineering College (CMREC), Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies including JNT University Hyderabad (JNTUH), Hyderabad and AICTE, New Delhi. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf. Thus, an autonomous institution is given the freedom to have its own examination system and monitoring mechanism, independent of the affiliating University but under its observance.

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

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

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

PRINCIPAL

ACADEMIC REGULATIONS FOR B.TECH. REGULAR STUDENTS WITH EFFECT FROM ACADEMIC YEAR 2020 – 21 (CMREC R-20)

For pursuing four year under graduate Bachelor Degree Programme of study in Engineering (B.Tech.) offered by CMR Engineering College under Autonomous status is here in referred to as CMREC (An Autonomous Institution)

All the rules specified here in approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2020-21 onwards. Any reference to “Institute” or “College” in these rules and regulations shall stand for CMR Engineering College (An Autonomous Institution).

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

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

CMR Engineering College offers a 4-year (8 semesters) Bachelor of Technology (B.Tech.) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year 2020-21.

ADMISSION

Admission first year of four-year B. Tech. Degree Program of study in Engineering

Eligibility

A candidate seeking admission into the first year of four year B. Tech. Degree Program should have:

Passed either Intermediate Public Examination (I.P.E.) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.

Secured a rank in the EAMCET examination conducted by the Telangana State Government or on the university or in the basis of any other order of merit approved by the university, for allotment of a seat by the Convener, EAMCET.

Admission Procedure

Admissions are made into the first year of four year B. Tech. Degree Program as per the stipulations of the TSCHE.

Category A seats are filled by the Convener, TSEAMCET (70%).

Category B seats are filled by the Management (30%).

Admission into the second year of four year B. Tech. degree Program in Engineering

Eligibility

A candidate seeking admission under lateral entry into the II year I Semester B. Tech. degree Program should have passed the qualifying exam (B.Sc. Mathematics or Diploma in concerned course) and based on the rank secured by the candidate in Engineering Common Entrance Test ECET (FDH) in accordance with the instructions received from the Convener, ECET and Government of Telangana allotted the seats.

Admission Procedure

Admissions are made into the II year of four year B. Tech. Degree Program through Convener, ECET (FDH) against the sanctioned strength in each Program of study as lateral entry students.

B. TECH. PROGRAMME STRUCTURE

Programs Offered

CMR Engineering College, an autonomous institution affiliated to JNTUH, offers the following B. Tech. Programs of study leading to the award of B. Tech. degree under the autonomous scheme.

B.Tech. Computer Science and Engineering

B.Tech. Computer Science and Engineering (Artificial Intelligence & Machine Learning)

B.Tech. Computer Science and Engineering (Data Science)

B.Tech. Computer Science and Engineering (Cyber Security)

B.Tech. Electronics and Communication Engineering

B.Tech. Information Technology

B.Tech. Mechanical Engineering

Duration of the Programs

A student after securing admission shall complete the B.Tech. programme in a minimum period of four academic years (8 semesters), and a maximum period of eight academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech. course. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the under graduate programme and award of the B.Tech. Degree.

UGC / AICTE specified definitions / descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations / norms, which are listed below.

Semester Scheme

Each under graduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each, each semester having - Continuous Internal Evaluation (CIE) and Semester End Examination (SEE).

Credit Courses

All subjects / courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject / course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

One credit for one hour / week / semester for theory / lecture (L) courses or Tutorials.

One credit for two hours / week / semester for laboratory / practical (P) courses. Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab are mandatory courses. These courses will not carry any credits.

Subject Course Classification

All subjects / courses offered for the under graduate program in E&T (B. Tech. degree programs) are broadly classified as follows.

S. No.	Broad Course Classification	Course Group / Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes mathematics, physics and chemistry subjects
2		ES - Engineering Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to humanities, social sciences and management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent Discipline / department / branch of Engineering
5	Elective Courses	PE – Professional Electives	Includes elective subjects related to the parent Discipline / department / branch of Engineering.

6	(ElC)	OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline / department / branch of Engineering.
7		Project Work	B.Tech. project or UG project or UG major project or Project Stage I & II
8	Core Courses	Industrial training / Mini- project	Industrial training / Summer Internship / Industrial Oriented Mini-project /Mini-project

9		Seminar	Seminar / Colloquium based on core contents related to parent discipline / department / branch of Engineering.
10	Mandatory Courses (MC)	-	Mandatory courses (non-credit)

COURSE REGISTRATION

A faculty advisor or counselor shall be assigned to a group of 20 students, who will advise the students about the under graduate programme, its course structure and curriculum, choice / option for subjects / courses, based on their competence, progress, pre-requisites and interest.

The academic section of the college invites “registration forms” from students before the beginning of the semester through “on-line registration”, ensuring “date and time of starting”. The on-line registration requests for any “current semester” shall be completed before the commencement of SEEs (Semester End Examinations) of the ‘preceding semester’.

A student can apply for on-line registration, only after obtaining the ‘written approval’ from faculty advisor / counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor / counselor and the student.

If the student submits ambiguous choices or multiple options or erroneous entries during on-line registration for the subject(s) / course(s) under a given / specified course group / category as listed in the course structure, only the first mentioned subject / course in that category will be taken into consideration.

Subject / course options exercised through on-line registration are final and cannot be changed or inter-changed further and alternate choices also will not be considered. However, if the subject / course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the head of the department, with due notification and time-framed schedule, within the first week after the commencement of class-work for that semester.

Dropping of subjects / courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor with in a period of 15days “from the beginning of the current semester”.

Open Elective Course: Students can choose One Open Elective Course (OEC-I) during VI Semester, one (OEC-II) during VII Semester and one (OEC-III) in VIII Semester from the list of Open Elective Courses given. However, Students cannot op

for an Open Elective Courses offered by their own (parent) Department, if it is there in the already listed under any category of the Subjects offered by parent Department in any Semester.

Professional Electives: The students have to choose six professional electives (PE-I to PE-VI) from the list of professional electives.

SUBJECTS / COURSES TO BE OFFERED

A typical section (or class) strength for each semester shall be 60.

A subject / course may be offered to the students, only if a minimum of 20 students (1/3 of the section strength) opt for it. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

More than one faculty member may offer the same subject (lab / practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on – “first come first serve basis and CGPA criterion” (i.e., the first focus shall be on early on-line entry from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

If more entries for registration of a subject comes into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject / course for two (or more) sections.

In case of options coming from students of other departments / branches / disciplines (not considering open electives), first priority shall be given to the student of the “Parent Department”.

ATTENDANCE REQUIREMENTS

A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab) for that semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. This attendance should be included in the fortnight attendance.

The attendance of Mandatory Non-Credit courses should be uploaded separately.

Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the students representation with supporting evidence.

A stipulated fee shall be payable for condoning of shortage of attendance.

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

Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester, in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and / or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.

A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 6.0.

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject / course, if student secures not less than 35% (25 marks out of 70 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing “C” grade or above in that subject / course.

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industrial Oriented Mini Project / Summer Internship and seminar, if the student secures not less than 40% marks (i.e., 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he/she (i) does not submit a report on Industrial Oriented Mini Project / Summer Internship, or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar as required in the IV year I Semester, or (iii) secures less than 40% marks in Industrial Oriented Mini Project / Summer Internship and seminar evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such “one reappearance” evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.

2	First year second semester to second year first semester	(i) Regular course of study of first year second semester.
		(ii) Must have secured at least 19 credits out of 39 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	Regular course of study of second year second semester. Must have secured at least 47 credits out of 79 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	Regular course of study of third year second semester. Must have secured at least 71 credits out of 119 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth	Regular course of study of fourth year

	year second semester	first semester.
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A student (i) shall register for all courses / subjects covering 160 credits as specified and listed in the course structure, (ii) fulfils all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA > 5.0 (in each semester), and CGPA (at the end of each successive semester) >5.0, (iv) passes all the mandatory courses, to successfully complete the under graduate program. The performance of the student in these 160 credits shall be taken into account for the calculation of “the final CGPA” (at the end of under graduate program), and shall be indicated in the grade card of IV year II semester.

If a student registers for “extra subjects” (in the parent department or other departments / branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his / her department, the performances in those “extra subjects” (although evaluated and graded using the same procedure as that of the required 160 credits) will not be taken into account while calculating the SGPA and CGPA. For such ‘extra subjects’ registered, percentage of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6.0 and 7.1 – 7.4 above.

A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure “C” grade or above) may reappear for that subject / course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject / course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

A student detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulations under which a student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which the student has been detained.

A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits. The academic regulations under which the student has been readmitted shall be applicable to him / her.

EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in every subject / course (including practical and Project Stage – I & II) will be evaluated for 100 marks each, with 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End-Examination).

For all Theory Courses as mentioned above, the distribution shall be 30 marks for CIE, and 70 marks for the SEE.

For Theory Subjects

Continuous Internal Evaluation (CIE)

During the Semester, there will be two mid-terms examinations for 30 marks each. Each mid-term examination consists of one subjective paper for 25 marks and assignment for 5 marks for each subject.

Question paper contains two Parts (Part-A and Part-B). The distribution of marks for PART- A and PART-B will be 10 marks & 15 marks respectively for UG programs.

Pattern of the question paper is as follows.

PART-A

Consists of Five Short answer Questions each carrying two mark. The I-Mid-term examination shall be conducted for the 50% of the syllabus and II-Mid-term examination shall be conducted for remaining 50% of the syllabus.

PART-B

Consists of Three questions (out of which students have to answer three questions) carrying five marks each. Each question there will be an “either” “or” choice (that means there will be two questions from each unit and the student should answer any one question). The questions may consist of sub-questions also.

The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

First Assignment should be submitted before the commencement of the first mid-term examinations, and the Second Assignment should be submitted before the commencement of the second mid-term examinations. The assignments shall be specified / given by the concerned subject teacher.

The total marks secured by the student in each mid-term examination are evaluated for 30 marks, and the average of the two mid - term examinations shall be taken as the final marks secured by each student in Continuous Internal Evaluation.

If any student is absent for any subject of Mid-term examination, an online test (CBT - Computer Based Test) will be conducted for him / her by the institute.

Semester End Examination (SEE)

The Semester End Examination (SEE) will be conducted for 70 marks consisting of Two parts i). Part - A for 20 marks ii). Part - B for 50 marks.

Part - A is compulsory question consisting of ten sub-questions. Two sub-questions from each unit and carry 2 marks each.

Part - B consist of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit may contain sub-questions. For each question there will be "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

For Practical Courses

Continuous Internal Evaluation (CIE)

There shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 marks with a distribution of 20 marks for day-to-day evaluation and 10 marks for internal lab exam. One internal practical test shall be conducted by the concerned laboratory teacher.

Semester End Examination (SEE)

SEE shall be conducted for 70 marks with an external examiner and the laboratory teacher concerned. The external examiner shall be appointed by the Chief Controller of Examinations of the college. The external examiner should be selected from the outside college among the autonomous / reputed institutions from a panel of three examiners submitted by the concerned BOS Chairman of the Department.

Engineering Graphics

For the Subjects having Design and / or Drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (20 marks for day-to-day work and timely submission of drawing sheets and 10 marks for internal tests). There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for CIE.

The distribution of marks for SEE shall be 70 marks. SEE shall consist of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub - questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

There shall be an Internship / Mini Project, in collaboration with an industry of their specialization. Students will register for this immediately after III year II semester (VI Semester) end examinations and pursue it during summer vacation. The evaluation of Mini project will be done at the end of IV Year I semester (VII semester). It shall be evaluated internally for 100 marks. The committee consisting of Project Coordinator, Supervisor of the project and one senior faculty of the department will evaluate the mini Project and award appropriate Grade, based on the report submitted to the department and presentation provided by the student in front of the committee.

Major Project - It shall be carried out in two stages

Project Stage – I shall be evaluated internally during IV Year I Semester, Project Stage – II shall be evaluated externally during IV Year II Semester. Each stage will be evaluated for 100 marks. Student has to submit project work report at the end of each semester. First report includes project work carried out in IV Year I semester and second report include project work carried out in IV Year I & II Semesters. SEE for both project stages shall be completed before the commencement of SEE Theory examinations.

For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall evaluate the project work for 70marks and project supervisor shall evaluate for 30 marks. Two reviews shall be conducted. Review-I will be conducted within a month from the commencement of class work (problem definition, objective, literature survey) and Review-II will be conducted before second mid examination (brief description and sample case study, progress of work, presentation and report submission). Average of the two reviews will be taken for 100 marks.

The student is deemed to have failed, if he (i) does not submit a report on Project Stage

- I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) secures less than 40% marks. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such “one reappearance” evaluation also, he has to reappear for the same in the subsequent

semesters, as and when it is scheduled. The topics for industrial oriented mini project, seminar and Project Stage – I shall be different from one another.

Project Stage – II is the continuation of Project Stage – I. It shall be evaluated by the external examiner for 70 marks and the project supervisor shall evaluate it for 30 marks. Two reviews should be conducted. Review-I will be conducted within a month from the commencement of class work (progress of work, discussion and presentation) and Review- II will be conducted before second mid examination (progress of work, results, discussion, presentation and report submission). Average of the two reviews will be taken for CIE. The Project Viva-voce (SEE) shall be conducted by a committee comprising of an External Examiner, Head of the Department and Project Supervisor. In SEE marks, 20% for working model / simulation / data collection, 20% for report preparation and 60% for presentation and viva-voce. The external examiner should be selected by Chief Controller of Examinations / Principal from outside the college among the autonomous / reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

The student is deemed to have failed, if he / she (i) does not submit a report on Project Stage II, or does not make a presentation of the same before the external examiner as per schedule, or (ii) secures less than 40% marks in the sum total of the CIE and SEE taken together. A student who has failed may reappear once for the above evaluation, when it is scheduled again; if student fails in such “one reappearance” evaluation also, he / she has to reappear for the same in the next subsequent semester, as and when it is scheduled.

Seminar

For Seminar presentation, the student shall collect the information on a specialized topic, prepare a Technical Report and submit to the department at the time of seminar presentation. The seminar presentation (along with the technical report) shall be evaluated by a committee consisting of Seminar coordinator and two senior faculty members with appropriate grade. The seminar report shall be evaluated internally for 100 marks. There shall be no semester end examination for the seminar.

Mandatory Non-Credit Courses

Mandatory Non-Credit Courses offered in any semester, a “Satisfactory / Not Satisfactory” shall be awarded to the student based on the performance in both CIE and SEE.

AWARD OF GRADES

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, seminar, Industry Oriented Mini Project, and project Stage - I & II. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8.0 above, a corresponding letter grade shall be given.

As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC / AICTE guidelines) and corresponding percentage of marks shall be followed.

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Absent	0

A student who has obtained an “F” grade in any subject shall be deemed to have “failed” and is required to reappear as a “supplementary student” in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

To a student who has not appeared for an examination in any subject, “Absent” grade will be allocated in that subject, and he / she is deemed to have “failed”. A student will be required to reappear as a “supplementary student” in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

A student earns grade point (GP) in each subject / course, on the basis of the letter grade secured in that subject / course. The corresponding “credit points” (CP) are computed by multiplying the grade point with credits for that particular subject / course.

Credit points (CP) = grade point (GP) x credits For a course

A student passes the subject / course only when $GP > 5$ (“C” grade or above)

The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points ($\sum CP$) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed a

For each semester,

where “i” is the subject indicator index (takes into account all subjects in a semester), “N” is the number of subjects “registered” for the semester (as specifically required and listed under the

course structure of the parent department), C_i is the number of credits allotted to the i th subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i th subject.

The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters, and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formulae

For all S semesters registered, (i.e., up to and inclusive of S semesters, $S > 2$),

where “ M ” is the total number of subjects (as specifically required and listed under the course structure of the parent department) the student has “registered” i.e., from the 1st semester onwards up to and inclusive of the 8th semester, “ j ” is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the number of credits allotted to the j th subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j th subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA

Course / Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	$4 \times 8 = 32$
Course 2	4	O	10	$4 \times 10 = 40$
Course 3	4	C	5	$4 \times 5 = 20$
Course 4	3	B	6	$3 \times 6 = 18$
Course 5	3	A+	9	$3 \times 9 = 27$
Course 6	3	C	5	$3 \times 5 = 15$
	21			152

$$\text{SGPA} = 152 / 21 = 7.24$$

Illustration of calculation of CGPA up to 3rd semester

	Course /	Credits	Letter	Corresponding	Credit
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Semester	Subject Title	Allotted	Grade Secured	Grade Point (GP)	Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15

II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total	69		Total Credit	518
	Credits			Points	

$$\text{CGPA} = 518 / 69 = 7.51$$

The above illustrated calculation process of CGPA will be followed for each subsequent semester until VIII semester. The CGPA obtained at the end of VIII semester will be the final CGPA secured for entire B. Tech. Program for the student.

For merit ranking or comparison purposes or any other listing, only the “rounded off” values of the CGPA’s will be used.

SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he / she passed his

/ her last exam in that semester. However, mandatory courses will not be taken into consideration.

PASSING STANDARDS

A student shall be declared successful or “passed” in a semester, if he / she secures a $\text{GP} \geq 5.00$ (“C” grade or above) in every subject / course in that semester (i.e., when the student gets an SGPA

> 5.00 at the end of that particular semester); and he shall be declared successful or “passed” in the entire under graduate program, only when gets a CGPA > 5.00 for the award of the degree as required.

After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, number of credits, grade earned, etc.), credits earned.

Declaration of results

Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

AWARD OF DEGREE

A student who registers for all the specified subjects / courses as listed in the course structure and secures the required number of 160 credits (with CGPA > 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have “qualified” for the award of B.Tech. Degree in the chosen branch of Engineering selected at the time of admission.

A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

Class Awarded	CGPA to be Secured	From the CGPA secured from 160 Credits
First Class with distinction	≥ 7.50	
First Class	≥ 6.50 and < 7.50	
Second Class	≥ 5.50 and < 6.50	
Pass Class	≥ 5.00 and < 5.50	
Fail	< 5.00	

WITHHOLDING OF RESULTS

If the student has not paid the tuition fees to the institution at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

STUDENT TRANSFERS

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

Transfer candidates (from non-autonomous college affiliated to JNTUH): A student who is following JNTUH curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he / she had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits up to the previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate joined after transfer and

subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

Transfer candidates (from an autonomous college affiliated to JNTUH): A student who has secured the required credits up to previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he / she had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he / she is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

SCOPE

The academic regulations should be read as a whole, for the purpose of any interpretation.

In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Council is final.

Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME) FROM
THE ACADEMIC YEAR 2021 – 22

Eligibility for award of B. Tech. Degree (LES)

The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

The student shall register for 121 credits and secure 121 credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree.

The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

The attendance requirements of B.Tech. (Regular) shall be applicable to B.Tech. (LES).

Promotion Rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	Regular course of study of second year second semester. Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester	Regular course of study of third year second semester. Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the

		relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S. No	Nature of Malpractices / Improper conduct	Punishment
	If the student	
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 student 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.
(b)	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 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.
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)	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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. The hall ticket of the student is to be

		cancelled and sent to the University.
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3	<p>Impersonates any other student in connection with the examination.</p>	<p>The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student 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. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student 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.</p>
4	<p>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.</p>	<p>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semesters. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the student is subject to the academic regulations in connection with For feature of seat.</p>

5	<p>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.</p>	<p>Cancellation of the performance in that subject.</p>
6	<p>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.</p>	<p>In case of students of the college, they shall be expelled from examination cancellation of their performance in subject and all other subjects</p> <p>the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinationsof</p> <p>the subjects of that semester. 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.</p>
7	<p>Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.</p>	<p>Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The student is also debarred for two consecutive semesters from class</p>

		<p>work and all University examinations.</p> <p>The continuation of the</p> <p>Course by the student is subject to the</p>
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		academic regulations in connection with forfeiture of seat.
8	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 the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The student is also debarred and forfeits the seat.
9	If student of the college, who is not a student 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.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the 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 student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
	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 student has appeared for including practical examinations and project work of that

11		semester examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award a suitable punishment.	

ACADEMIC CALENDER (2024-25)

S.NO	DATE	NAME OF THE EVENT
1	29/07/2024	Commencement of Class Work
2	29/07/2024-21/09/2024	I Spell of instructions
3	02/08/2024-03/08/2024	IV B.Tech Mini Project Work Review I
4	07/08/2024	Student Workshop-I for IV Year
5	06/09/2024	Student Workshop-I for III Year
6	07/08/2024	Industrial visit
6	07/09/2024 - 08/09/2024	IV B.Tech Mini Project Work Review II
7	09/09/2024 - 12/09/2024	I MID Exams for IV Year
8	30/09/2024-03/10/2024	I MID Lab Internal Exam for IV Years
9	13/09/2024 - 14/09/2024	IV B.Tech Major Project Work Review I
10	14/09/2024	Guest lecture for III year
11	27/09/2024 - 28/09/2024	IV B.Tech Mini Project Work Review II
12	30/09/2024-05/10/2024	I MID Exams for II & III Years
13	30/09/2024-03/10/2024	I MID Lab Internal Exam for II, & III Years
14	05/10/2024	Submission of I mid marks to University
15	16/09/2024	Professional Body Activities
16	07/10/2024-12/10/2024	Dussehra Recess
17	30/09/2024-30/11/2024	II Spell of instructions (Including I mid examinations)
18	30/09/2024-05/10/2024	I MID Exams for II, III & IV Years
19	30/09/2024-03/10/2024	I MID Lab Internal Exam for II, & III Years
20	05/10/2024	Submission of I mid marks to University
21	21/10/2024 - 22/10/2024	IV B.Tech Mini Project Work Review III
22	11/11/2024 - 16/11/2024	II MID Exams for IV Years
23	12/11/2024	Workshop for II year
24	15/11/2024 - 16/11/2024	IV B.Tech Major Project Work Review II
25	28/11/2024 - 30/11/2024	II MID Lab Internal Exam for II, & III Years
26	02/12/2024 - 07/12/2024	II MID Exams for II&III Years
27	09/12/2024 - 11/12/2024	Lab External Exam for IV Year
28	09/12/2024 - 11/12/2024	Lab External Exam for II, & III Years
29	09/12/2024 - 14/12/2024	Preparation Holidays and Practical Examinations
30	14/12/2024	Submission of II mid marks to University
31	16/12/2024 -28/12/2024	End Semester Exams

DEPARTMENT EVENT PLANER (2024-25)

LIST OF SUBJECTS

S.NO	SUBJECT NAME
1	OPEN ELECTIVE-III/MOOCs
2	PROFESSIONAL ELECTIVE-V/ MOOCs
3	PROFESSIONAL ELECTIVE-VI
4	SEMINAR
5	PROJECT-II

ACADEMIC PLANNER
FOR THE
ACADEMIC YEAR
2023-24

COURSE: IV YEAR B.TECH ECE-II-R20- SEM

SUBJECT: GLOBAL POSITIONING SYSTEM

CREDITS: 3

ACADEMIC PLANNER

SUBJECT: GLOBAL POSITIONING SYSTEM

S.NO

CONTENTS

- (1) - Preamble/Introduction
- (2) - Prerequisites
- (3) - Objectives and Outcomes
- (4) - Syllabus
 - 1. JNTU/R20-CMREC
 - 2. GATE
 - 3. IES
- (5) - List of Expert Details (Local/National/International with Contact details/Profile link/Blogs/their research Contribution towards the subject)
- (6) - Journals with min 5 ref paper for literature study
- (7) - Subject -Lesson plan
- (8) - Suggested Books (prescribed and References)
- (9) - Websites for self learning Resources like
(www.geeksforgeeks.org, www.schools.com, Coursera ,edX, Udemy, Khan Academy, NPTEL etc along Registration procedures)
- (10) - Question Banks
 - 1.JNTUH/Model papers
 - 2. GATE
- (11) - Two case study presentations with Project / Product/ Model /prototypes/ Industrial applications.
- (12) - Assignment Question/Innovative Assignments sets.
- (13) - List of topics for students Seminars with Guidelines
- (14) - STEP/Course material in softcopy
- (15) - Expert Lectures with topics & Schedules(if any)

(1) PREAMBLE/INTRODUCTION :

The Global Positioning System was conceived in 1960 under the auspices of the U.S. Air Force, but in 1974 the other branches of the U.S. military joined the effort. The first satellites were launched into space in 1978. The System was declared fully operational in April 1995. The Global Positioning System consists of 24 satellites, that circle the globe once every 12 hours, to provide worldwide position, time and velocity information. GPS makes it possible to precisely identify locations on the earth by measuring distance from the satellites. GPS allows you to record or create locations from places on the earth and help you navigate to and from those places. Originally the System was designed only for military applications and it wasn't until the 1980's that it was made available for civilian use also.

(2) PREREQUISITES:

This course assumes that students have had an introduction to communication systems and the description of signals and circuits in terms of their frequency spectra and frequency response. A basic knowledge of analog and digital modulation is required, as is a working level familiarity with the basics of random variables and probability distributions

(3) COURSE OBJECTIVE & OUTCOMES:

- 1.To prepare students to excel in basic knowledge of satellite communication principles
- 2.To provide students with solid foundation in orbital mechanics and launches for the satellite communication
- 3.To train the students with a basic knowledge of link design of satellite with a design examples.
- 4.To provide better understanding of multiple access systems and earth station technology

5.To prepare students with knowledge in satellite navigation and GPS & and satellite packet communications.

PROGRAM EDUCATION OUTCOMES

1. Graduates will demonstrate knowledge of mathematics, science and engineering.
2. Graduates will demonstrate an ability to identify, formulate and solve engineering problems.
3. Graduate will demonstrate an ability to design and conduct experiments, analyze and interpret data.
4. Graduates will demonstrate an ability to design a system, component or process as per needs and specifications.
5. Graduates will demonstrate an ability to visualize and work on laboratory and multidisciplinary tasks.
6. Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.
7. Graduates will demonstrate knowledge of professional and ethical responsibilities.
8. Graduate will be able to communicate effectively in both verbal and written form.
9. Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.
10. Graduate will develop confidence for self education and ability for life-long learning.
11. Graduate who can participate and succeed in competitive examinations.

PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering

fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions: 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.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: 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.

PO6: The Engineer and Society: 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.

PO7: Environment and Sustainability: Understand the impact of the professional

engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: 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.

PO11:Project management and finance: 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.

PO12: Life-long learning: 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

PROGRAM SPECIFIC OUTCOMES(PSO'S)

1. PSO1: Ability to apply concepts of Electronics & Communication Engineering to associated research areas of electronics, communication, signal processing, VLSI, embedded systems, IoT and allied technologies.
2. PSO2: Ability to design, analyze and simulate a variety of Electronics & Communication functional elements using hardware and software tools along with analytic skills.s

COURSE NAME: GLOBAL POSITIONING SYSTEM

SUBJECT CODE	COURSE OUTCOMES
EC863PE.1	Explain basic physical principles of remote sensing
EC863PE.2	Understand the basic difference between various kinds of satellites and sensors
EC863PE.3	Know the appropriate use of satellite data for different applications
EC863PE.4	Explain the principles of thermal and microwave satellites, sensors and their nature of the data
EC863PE.5	Apply remote sensing in different thematic studies.

CO-PO MATRIX:

Course Outcomes (CO)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
EC863PE	2	2	2	2			2			2		
EC863PE	2	2		2	3					2		
EC863PE	2		2	2			2		2			2
EC863PE	2	2	2							2	2	
EC863PE			2	2	2				2			

COURSE OUTCOME (CO)-PROGRAM SPECIFIC OUTCOME (PSO) MATRIX:

Course Outcomes (CO's)	PSO1	PSO2
EC863PE.1	2	3
EC863PE.2		
EC863PE.3	2	3
EC863PE.4	2	2
EC863PE.5	3	2

(4) SCOPE:

The scope of this subject is to provide a thorough knowledge of the process how Global positioning systems operate remotely and how communication across the globe is exercised.

(5) SYLLABUS:

B.Tech. IV Year II Sem.

L T P C

Course Code: EC863PE

3 0 0 3

UNIT - I Introduction: Basic concept, system architecture, GPS and GLONASS Overview, Satellite Navigation, Time and GPS, User position and velocity calculations, GPS, Satellite Constellation, Operation Segment, User receiving Equipment, Space Segment Phased development, GPS aided Geo augmented navigation (GAGAN) architecture.

UNIT - II **Signal Characteristics:** GPS signal components, purpose, properties and power level, signal acquisition and tracking, Navigation information extraction, pseudorange estimation, frequency estimation, GPS satellite position calculation, Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT - III **GPS Receivers & Data Errors:** Receiver Architecture, receiver design options, Antenna design, GPS error sources, SA errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error, estimation using dual frequency GPS receiver, multipath, ionospheric error, estimation using dual frequency GPS.

UNIT - IV **Differential GPS:** Introduction, LADGPS, WADGPS, Wide Area Augmentation systems, GEO Uplink subsystem, GEO downlink systems, Geo Orbit determination, Geometric analysis, covariance analysis, GPS /INS Integration Architectures

UNIT - V **GPS Applications:** GPS in surveying, Mapping and Geographical Information System, Precision approach Aircraft landing system, Military and Space application, intelligent transportation system. GPS orbital parameters, description of receiver independent exchange format (RINEX) , Observation data and navigation message data parameters, GPS position determination, least squares method

TEXT BOOK: 1. Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, "Global positioning systems, Inertial Navigation and Integration", Wiley 2007.

REFERENCE BOOK: 1. E.D.Kaplan, Christopher J. Hegarty, "Understanding GPS Principles and Applications", Artech House Boston 2005.

GATE SYLLABUS: not applicable

IES SYLLABUS: not applicable

(6) SUBJECT EXPERTS DETAILS:

INTERNATIONAL:

1. Ms. Marie A Mak, Acting director, Acquisition Systems, Washington, DC 20548.
2. Tracy M. L. Brown ; Steven A. McCabe ; Charles Wellford, US

NATIONAL:

1. Dr. Sundeep Prabhakar hepuri, Dept of ECE, IISc Bangalore.
2. Dr. Dharmendra Kumar Singh, Professor, NIT Patna.

REGIONAL:

1. Dr. S. Anuradha, Dept of ECE, NITW, Warangal
2. Dr. T. Jaganatha swamy, Professor, Dept of ECE, GRIET

(7) JOURNAL WITH MIN 5 REF PAPERS FOR LITERATURE SURVEY STUDY:

1. <https://ieeexplore.ieee.org/document/1614066/authors#authors>

Title: Wearable Antenna Integrated into Military Berets for Indoor/Outdoor Positioning System

2. <https://ieeexplore.ieee.org/document/482137>

Title: Characteristics of the Trends in the Global Tropopause Estimated From COSMIC Radio Occultation Data

3. <https://ieeexplore.ieee.org/document/109205>

Title: Diversity systems comparison of satellite visibility improvement for designing mobile broadcasting satellite system

4. <https://ieeexplore.ieee.org/document/1161901>

Title: Example of a mixed-signal Global Positioning System (GPS) receiver using MCM-L packaging

5. <https://ieeexplore.ieee.org/document/1162619>

Title: GPS-Based System for the Measurement of Synchronized Harmonic Phasors

(8) LESSON PLAN :

Name of the topic	Sub topics	No. of classes	Text books	Remarks
UNIT I				
Introduction	Basic concept, system architecture	L1, L2,	T1,R1	
	GPS and GLONASS Overview	L3,L4	T1,R1	
	Satellite Navigation, Time and GPS, User position and velocity calculations,GPS	L5,L6,L7	T1,R1	
	Satellite Constellation, Operation Segment, User receiving Equipment	L8,L9	T1,R1	
	Space Segment Phased development, GPS aided Geoaugmented navigation (GAGAN) architecture.	L10,L11, L12	T1,R1	
	No. of classes required: 12			
UNIT II				
Signal Characteristics	GPS signal components, purpose, properties and power level, signal acquisition and tracking	L13,L14, L15	T1,R1,T2	
	Navigation information extraction, pseudorange estimation	L16,L17	T1,R1,T2	
	frequency estimation, GPS satellite position calculation, Signal structure,	L18, L19, L20,	T1,R1,T2	
	anti spoofing (AS), selective availability	L21,L22, L23,	T1,R1,T2	
	Difference between GPS and GALILEO satellite construction.	L24, L25	T1,R1,T2	
	No. of classes required:13			

UNIT III				
GPS Receivers & Data Errors	GPS Receivers & Data Errors: Receiver Architecture	L26,L27	T1,R1	
	receiver design options, Antenna design, GPS error sources	L28,L29,L30	T1,R1	
	errors, propagation errors, ionospheric error, tropospheric error, multipath, ionospheric error	L31, L32, L33	T1,R1	
	multipath, ionospheric error, estimation using dual frequency GPS	L34,L35,L36	T1,R1	
	No. of classes required:11			
UNIT IV				
Differential GPS	Introduction, LADGPS, WADGPS	L37,L438, L39	T1,R1	
	Wide Area Augmentation systems	L40,L41,L42, L43,	T1,R1	
	Precision approach Aircraft landing system, Military and Space application,	L44,L45,L46, L47,	T1,R1	
	Geometric analysis, covariance analysis,	L48, L49	T1,R1	
	GPS /INS Integration Architectures	L50	T1,R1	
	No. of classes required:14			
UNIT V				
GPS Applications	GPS in surveying, Mapping and Geographical Information System	L51,L52	T1,R1	
	Precision approach Aircraft landing system, Military and Space application	L53,L54,	T1,R1	
	intelligent transportation system. GPS orbital parameters, description of receiver	L55, L56	T1,R1	

	independent			
	exchange format (RINEX) , Observation data and navigation message data parameters	L57,L58	T1,R1	
	No. of classes required:08			
	Total No. of Classes :58			

(9) SUGGESTED BOOKS:

TEXT BOOK:

1. Mohinder S.Grewal, Lawrence R.Weill, Angus P.Andrews, "Global positioning systems, Inertial Navigation and Integration", Wiley 2007.

REFERENCE:

1. E.D.Kaplan, Christopher J. Hegarty, "Understanding GPS Principles and Applications", Artech House Boston 2005

WEBSITES FOR SELF LEARNING RESOURCES:

- 1). <https://www.youtube.com/watch?v=08wH5k4uJ3s>
- 2) https://www.youtube.com/watch?v=wCcARVbL_Dk
- 3). https://www.youtube.com/watch?v=8eTII19_57g
- 4).[https://www.youtube.com/watch?v=08wH5k4uJ3s&list=RDCMUCCDzHkpuluD5\).1ZC0wsCXUuPQ&start_radio=1&t=43](https://www.youtube.com/watch?v=08wH5k4uJ3s&list=RDCMUCCDzHkpuluD5).1ZC0wsCXUuPQ&start_radio=1&t=43)
<https://www.youtube.com/watch?v=dhTnEcV4QVo>

(10) QUESTION BANK:



QUESTIONBANK-JNTU-H-MODEL.rar

(11) CASE STUDY

Project 1:-

TITLE:-RTOS based vehicle tracking system

Abstract:

The ability to track vehicles is useful in many applications including security of personal vehicles, public transportation systems, School buses and others. Therefore, the development of vehicle tracking system using the Global Positioning System (GPS) and Global System for Mobile Communications (GSM) modem is with the aim of enabling users to locate their vehicles with ease and in a useful manner. The system will provide users with the capability to track vehicle remotely through the mobile network. This project mainly deals with concept of Vehicle tracking, Monitoring and so gives a better supervision to the target vehicle. This system is based on ARM7, GSM and GPS. GSM technology is used to send information about the vehicle. This information contains exact location of the vehicle. ARM7 TDMI core LPC 2148 processor with collects the information and sends to the Monitoring system using GSM modem. The Monitoring system uses GUI (Graphical User Interface) to display the received information on Google Map.

Project 2:-

TITLE :Guiding & control of fishermen boat using GPS

Abstract:

In this modern world, there are many technologies that are emerging day to day but no such technology is being efficiently and economically used to the fisherman in terms of their safety. The main drawback in the sea is that the fisherman are unaware of the border which makes them to cross the limit provided for their nation and ultimately they get caught into trouble. Our paper involves the Global Positioning Satellite System technology for tracking the position of the boat in the form of latitude and longitude. The received signal from the boat position is compared with the present value time to time. As a result of the comparison, the motor of the boat is operated in three different modes such as normal, slow and reverse. By employing this technique, the fisherman could get enough knowledge about their position which helps them to be in the safer zone.

(12) MODEL PAPERS

SEPTEMBER 2020 MODEL PAPERS:

1. Draw the functional block diagram of the Master Control Station. Also explain the functions of each block. [15]
- 2.a) Explain the trilateration method to estimate GPS receiver position in

b) Compare GPS and GALILEO system with respect to satellite constellation and signal structure. [8+7]
- 3.a) Explain the characteristics of C/A code.

- b) Derive the equation for ionospheric delay for phase range measurement starting from the refractive index. [5+10]
4. Draw the schematic functional block diagram of the GPS receiver. List the signal processing functions of the GPS receiver. [15]
5. Explain the following errors in GPS receivers: a) Ionospheric errors b) Tropospheric errors c) SA errors. [15]
- 6.a) With the help of a neat diagram explain Wide Area DGPS. b) Compare GEO uplink and down link systems. [10+5]
- 7.a) How the GEO orbit can be determined by geometric analysis.
- b) Explain the RINEX format of observation and navigation data files. [8+7]
8. Describe the steps involved in receiver position estimation using Least Squares Approximation method. [15]

DECEMBER 2020 MODEL PAPER:

1. How to determine the user position and velocity from received satellite ephemeris? Explain. [15]
2. Discuss briefly about User segment, Control segment and Space segment. [15]
3. Describe C/A code and P-code Generations with block diagrams. [15]
- 4.a) How Pseudo range is different from True range? b) Describe Selective Availability and how the Selective Availability is achieved. [6+9]
5. Draw the schematic functional block diagram of the generic GPS receiver and explain each block in detail. [15]
- 6.a) Describe how ionospheric delay is estimated using dual frequency GPS receiver measurements.
b) Define the tropospheric delay. [12+3]
- 7.a) Discuss the salient features of WADGPS.
- b) What is Wide Area Augmentation System? [10+5]
8. Describe Receiver Independent Exchange format (RINEX) of GPS observation and navigation data. [15]

(13) ASSIGNMENT QUESTIONS /INNOVATIVE ASSIGNMENT QUESTIONS:

PART-A

- 1.Explain satellite constellation
- 2.Describe GPS satellite position calculations.
- 3.List out the application of GPS.
- 4.Explain Difference between GPS and GALILEO satellite construction.
- 5.Explain the GPS Receiver Architecture

PART-B

- 1.Explain the method multiple mitigation.
- 2.Explain EPHEMERIS data errors and clock errors.
- 3.Describe GPS/INS integration architecture.
- 4.Give a brief note of how GPS works in military and space application
- 5.Describe about RINEX in GPS.

(14) IMPORTANT QUESTION SETS ON EACH UNIT

UNIT 1

- 1.Explain satellite constellation
- 2.Describe in detail about GAGAN Architecture.
- 3.Write about satellite navigation time and GPS.
- 4.What is space segment phase development system.
- 5.Give a brief overview of GPS and GLONASS system.

UNIT 2

- 1.Explain the terms pseudo range estimation and frequency estimation.
2. Explain Difference between GPS and GALILEO satellite construction.
- 3.Describe GPS satellite position calculations
- 4.Describe the signal acquisition, tracking and navigation of GPS
- 5.Write about ant spoofing

UNIT 3

1. Explain the GPS Receiver Architecture
- 2.Explain the following errors
 - a.SA errors
 - b .Propagation errors

c. Ionospheric errors

d. Tropospheric errors

3.Explain about Antenna design in GPS Receivers.

4.Write about the methods of multiple mitigations

5.Describe about EPHEMERIS data errors and clock errors.

UNIT 4

1.Describe about GEO orbit determination.

2.Explain wide area augmentation system.

3.Describe GEO uplink subsystem.

4. Describe GPS/INS integration architecture.

5.Explain about GEO Orbit determination

UNIT 5

1..Give a brief note of how GPS works in military and space application

2. Describe about RINEX in GPS.

3.Give a brief note of how GPS works in Aircraft landing system

4.Give a brief note of how GPS works in Intelligent transportation system.

5.Explain about least squares method

STEP/COURSE MATERIAL:

1. What is the accuracy of a GPS receiver?

A basic GPS system has accuracy of between one and two meters, depending on propagation specifics and performance of some receiver components. There are enhanced techniques such as differential GPS (where the GPS receiver is also linked to a nearby reference location), that can yield position accuracy on the order of a few centimeters.

2. Who manages the GPS system?

The U.S. Air Force is responsible for the satellites, the launches, maintaining the system, and correcting the signals as needed as the orbits change (and they do) or other perturbations occur.

3. Can GPS determine the direction in which you are pointing, from a single reading?

No. In contrast to a compass, a single GPS reading provides only location, not orientation. But if you move and take a second or series of GPS readings, then you will know its direction.

4. How many satellites does GPS require?

To ensure that users anywhere on Earth can have an unobstructed view of at least four satellites (the needed minimum), the GPS system provides an evenly spaced core constellation of 24 medium-Earth-orbit satellites in six different orbital planes, although only 12 are required for full Earth coverage; the others provide more “viewing” opportunities as well as redundancy.

5. What critical development allowed the idea of GPS satellites to become a reality?

Although there were many critical technical developments, one key advance was the availability of the lightweight, low-power atomic clock which each satellite needs for precise timing of its signals. This allows the satellite codes to be sent with extremely high timing accuracy, and is essential to the system performance. Other developments include sensitive, low-noise front-end amplifiers which operate at 1 GHz, and the processing power (via microprocessors or FPGAs) which can implement the complex, intensive algorithms in real time or nearly so.

6. How is the GPS system organized?

There are three functional segments: the control segment, the space segment, and the user segment:

7. The control segment includes the master control station which communicates with the satellites as needed, and manages overall system performance and parameters, many of which need adjustment due to inevitable drifts, aging, and orbit shifts;

8. The space segment consists of the satellites,

9. What about the control segment?

The control segment must not only communicate with each satellite, but it must also determine what imperfections and changes the satellite orbits have undergone. To do this, there are multiple Earth-based stations at locations known with extreme accuracy

and precision. Each base station uses radar and other techniques to ascertain the details of the orbit of each satellite.

10. What is the nature of the encoding for the transmitted signals?

The satellites use pseudorandom sequences (PRSQ), which are resistant to noise and corruption, and easier to correlate. There are actually two such PRSQ sequences: the P-code pattern is long and provides more time-alignment, while the C/A code is shorter and less precise, but supports faster acquisition and analysis. Timing of these signals must be accurate and measurable to nanoseconds for GPS to be useful.

11. Who Uses Gps?

GPS is used to support land, sea, and airborne navigation, surveying, Geophysical exploration, mapping and geodesy, vehicle location systems, and a wide variety of additional applications.

12. What Is Gps?

GPS is a satellite-based radionavigation system developed and operated by the U.S. Department of Defense (DOD). GPS permits land, sea, and airborne users to determine their three-dimensional position, velocity, and time 24 hours a day, in all weather, anywhere in the world with a precision and accuracy far better than other radionavigation systems available today or in the foreseeable future.

13. How Is Gps Used?

GPS receivers collect signals from satellites in view. They display the user's position, velocity, and time, as needed for their marine, terrestrial, or aeronautical applications. Some display additional data, such as distance and bearing to selected waypoints or digital charts.

(15) LIST OF TOPICS FOR STUDENT SEMINARS

1. GPS and GLONASS Overview,
2. Satellite Navigation,
3. GPS aided Geo augmented navigation (GAGAN) architecture.
4. GPS signal components, purpose, properties and power level,
5. Signal acquisition and tracking
6. GPS satellite position calculation,

7. Difference between GPS and GALILEO satellite construction.
8. GPS Receivers
9. Antenna design
10. GEO Uplink subsystem
11. GEO downlink systems
12. Geo Orbit determination
13. Mapping and Geographical Information System

ACADEMIC PLANNER

Subject: ELECTRONIC MEASUREMENTS&INSTRUMENTATION

<u>S.NO</u>	<u>CONTENT</u>
(1) -	Preamble/Introduction
(2) -	Prerequisites
(3) -	Objectives and Outcomes
(4) -	Syllabus 1. CMREC-R20 2. GATE 3. IES
(5) -	List of Expert Details (Local/National/International with Contact details/Profile link/Blogs/their Contribution towards the research subject)
(6) -	Journals with min 5 ref paper for literature study
(7) -	Subject -Lesson plan
(8) -	Suggested Books (prescribed and References)
(9) -	Websites for self learning Resources like <i>www.geeksforgeeks.org, www.schools.com, Coursera,edX,</i> <i>Udemy, Khan Academy, NPTEL etc along Registration</i> procedures)
(10) -	Question Banks 1.JNTUH/Model papers 2.GATE
(11) -	Two case study presentations with Project / Product/ Model /prototypes/ Industrial applications.
(12) -	Assignment Question/Innovative Assignments sets.
(13) -	List of topics for students Seminars with Guidelines
(14) -	STEP/Course material in softcopy
(15) -	Expert Lectures with topics & Schedules(if any)

Subject: **Network Security & Cryptography**

Year: **IV– B.Tech, II SEM**

Branch: **ECE**

1. PREAMBLE/INTRODUCTION

Network security is any activity designed to protect the usability and integrity of your network and data. It includes both hardware and software technologies. It targets a variety of threats. It stops them from entering or spreading on your network. Effective network security manages access to the network. Cryptography is the process of hiding or coding information so that only the person a message was intended for can read it. The art of cryptography has been used to code messages for thousands of years and continues to be used in bank cards, computer passwords, and ecommerce.

2. PRE REQUISITES

- ✓ A strong understanding of mathematical principles.
- ✓ Such as linear algebra, number theory, and combinatorics.

3. OBJECTIVES AND RELEVANCE:

- ❖ Understand the basic concept of Cryptography and Network security, their mathematical models.
- ❖ To Provide deeper understanding of application to network security, threats/vulnerabilities to networks and countermeasures.
- ❖ To create an understanding of authentication functions the manner in which message authentication codes and hash functions works.
- ❖ To provide familiarity in intrusion detection and firewall design principles.

COURSE OUTCOMES:

CO 1	To analyze a computer and network security fundamental concepts, different types of threats, malware, spyware, viruses, vulnerabilities.
CO 2	To evaluate Encryption algorithms using block ciphers.
CO 3	To Analyze key agreement algorithms to identify their weaknesses.
CO 4	To understand the message authentication and hash functions, inner working of popular encryption algorithms and authentication applications.
CO 5	To understand the concept of IP security, Intruders, viruses and worms, Fire walls.

(4) SYLLABUS

UNIT - I Introduction: Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques. Modern Techniques: Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT – II Encryption: Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block ciphers. Conventional Encryption: Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT – III Public Key Cryptography: Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Number Theory: Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT – IV Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Hash and Mac Algorithms: MD5, Message digest Algorithm, Secure Hash Algorithm. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT – V IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, secure sockets layer, and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms: Intruders, Viruses and Related threats. Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS: 1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.

2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson. 4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH 5. Introduction to Cryptography, Buchmann, Springer.

4. GATE & IES

No gate syllabus from this subject

5. Expert Details

INTERNATIONAL

Daniel Shiu: Chief Cryptographer, ARQIT

A Chief Cryptographer at ARQIT, a London-based startup focused on cybersecurity, space, telecoms, encryption, quantum, and QKD, Daniel Shui worked for GCHQ, the UK's intelligence, cyber and security agency for 20 years. He was the UK's Head of Cryptographic Design and Quantum Information Processing, part of the initial National Technical Authority function assumed by the new National Cyber Security Centre (NCSC).

NATIONAL

[Vishal Saraswat](#)[Vishal Saraswat is a *cryptology expert* and security consultant at Bosch Engineering and Business Solutions, Bangalore, India.](#)

REGIONAL

DR. P. SWETHA

Professor of CSE & Deputy Director , Directorate of Academic Affairs, (On deputation at JNTUH-Hyderabad)

6. JOURNALS.

1. [HTTPS://IEEEXPLORE.IEEE.ORG/DOCUMENT/9335952](https://ieeexplore.ieee.org/document/9335952)

Title: Network Coding-Based Post-Quantum Cryptography

2. [HTTPS://IEEEXPLORE.IEEE.ORG/DOCUMENT/9526558](https://ieeexplore.ieee.org/document/9526558)

[Security and Privacy Schemes in Vehicular Ad-Hoc Network With Identity-Based Cryptography Approach: A Survey](#)

3. <https://ieeexplore.ieee.org/document/8537887>

Steganography Security: Principle and Practice

7. Teaching Schedule/Lesson plan

S.NO	TOPIC TO BE COVERED	Suggested Books (Eg. T1, T2,R5)	NO. OF LECTURES REQUIRED	Remarks
UNIT-I				
1	Introduction: Attacks, Services and Mechanisms.	T1,T2,R1	2	
2	Security services, A Model for Internetwork security, Classical Techniques:	T1,T2,R1	2	

3	Conventional Encryption model, Steganography, Classical Encryption Techniques.	T1,T2,R1	3	14
4	Modern Techniques: Simplified DES, Block Cipher Principles,	T1,T2,R1	2	
5	Data Encryption standard, Strength of DES, Block Cipher Design Principles	T2,R3	2	
6	Block Cipher Design Principles	T2,R3	3	
UNIT-II				
7	Encryption: Triple DES	T1,T2,R3	1	12
8	Triple DES	T1,T2,R2	1	
9	International Data Encryption algorithm,	T1,T2,R3	1	
10	Blowfish, RC5, Characteristics of Advanced Symmetric block ciphers.	T1,T2,R3	1	
11	Conventional Encryption	T1,T2,R3	1	
12	Placement of Encryption function	T1,T2,R2	2	
13	Traffic confidentiality	T1,T2,R2,R3	2	
14	Key distribution,	T1,T2,R2,R3	1	
15	Random Number Generation.	T1,T2,R1,R2,R3	2	
UNIT-III				
16	Public Key Cryptography	T1, T2,R3	1	12
17	Principles, RSA Algorithm	T1, T2,R3	1	
18	Key Management,	T1, T2,R2,R3	1	

19	Diffie-Hellman Key exchange	T1, T2,R3	1	
20	Elliptic Curve Cryptography	T1, T2,R3	1	
21	Number Theory: Prime and Relatively prime numbers,	T1,T2,R3	1	
22	Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.	T1,T2,R3	1	
23	Fermat's and Euler's theorems,	T1,T2,R3	1	
24	Testing for primality,	T1,T2,R3	1	
25	Euclid's Algorithm	T1,T2,R3	1	
26	the Chinese remainder theorem	T1,T2,R3	1	
27	Discrete logarithms.	T1,T2,R3	1	
UNIT-IV				
28	Message Authentication and Hash Functions: Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Hash and Mac Algorithms: MD File, Message digest Algorithm, Secure Hash Algorithm. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards. Authentication Applications: Kerberos, Electronic Mail Security: Pretty Good Privacy,	T1,T2,R3	1	12

	S/MIME.			
29	Authentication requirements and functions, Message Authentication,	T1,T2,R3	1	
30	Hash functions, Security of Hash functions and MACs	T1,T2,R3	2	
31	Hash and Mac Algorithms: MD File, Message digest Algorithm	T1,T2,R3	2	
32	Secure Hash Algorithm. Digital signatures and Authentication protocols:	T1,T2,R3	2	
33	Digital signatures, Authentication Protocols	T1,T2,R3	2	
34	Euclid's Algorithm,	T1,T2,R2,R3	1	
35	The Chinese remainder theorem,	T1,T2,R2,R3	1	
36	Discrete logarithms.	T1,T2,R2,R3	1	
37	Digital signature standards. Authentication Applications: Kerberos,	T1,T2,R2,R3	2	
38	Pretty Good Privacy, S/MIME.	T1,T2,R2,R3	2	
	UNIT-V			
39	IP Security: Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, secure sockets layer, and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms: Intruders, Viruses and Related threats. Fire Walls: Fire wall Design Principles, Trusted systems.	T1,T2,R1,R3	2	11
40	Encapsulating Security Payload, Key Management. Web Security	T1,T2,R1,R2,R3	3	
41	: Web Security requirements, secure	T1,T2,R1,R2,R3	2	

	sockets layer, and Transport layer security,			
42	Secure Electronic Transaction. Intruders, Viruses and Worms: Intruders,	T1,T2,R2,R3,R4	2	
43	Viruses and Related threats. Fire Walls: Fire wall Design Principles, Trusted systems.		2	
Total Classes				61

(8) - Suggested Books (prescribed and References)

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography, Buchmann, Springer.

(9) – Websites for self learning Resources like

www.geeksforgeeks.org, www.schools.com, Coursera,edx,Udemy, Khan Academy, NPTEL etc along Registration Procedures.

<https://archive.nptel.ac.in/courses/106/105/106105162/>

<https://www.geeksforgeeks.org/cryptography-and-network-security-principles/>

<https://www.youtube.com/watch?v=JoeiLuFNBc4>

<http://www.faadooengineers.com/online-study/post/cse/cryptography/1/block-cipher-principles>

<http://www.faadooengineers.com/online-study/post/cse/cryptography/1/block-cipher-principles>

(10) – Question Bank

1. JNTUH/Model papers



PREVIOUS QP.rar

UNIT-I

1. What is the difference between passive and active threats?
2. Explain about various principle for design of Block Cipher
3. List and briefly define categories of Security Services and attacks.
4. Explain triple DES Algorithm with an example
5. How would you test a piece of cipher text to determine quickly if it was likely the result of a simple substitution? Explain.
6. Describe the model for network security with neat sketch.
7. Write any three transposition ciphers with examples.
8. Briefly explain various security attacks with clear illustration.
9. Explain the model for internetwork security.
10. How is steganography different from Cryptography? Will it result in better security combining the two? If so, how? If not, why?
11. Differentiate IDEA and DES algorithm.

UNIT-II

1. Differentiate between RC5 and blowfish.
2. Explain different Key distribution Approaches of Message Authentication.
3. Describe about conventional encryption algorithms.
4. Enumerate in detail about the steps in Blow Fish Algorithm and explain the process of each round with a neat diagram.
5. Explain the differences between DES and Triple DES algorithm

UNIT-III

1. Summarize the public key cryptographic principles. Explain RSA algorithm for given example, where $p = 3$ and $q = 11$.
2. Enumerate Diffie-Hellman Key exchange for encryption and decryption with suitable examples.
3. Critically analyze the security of RSA.
4. Explain fermat's and Euler's Theorem in brief.
5. In a public-key system using RSA, you intercept the cipher text $C = 10$ sent to a user whose public key is $e = 5$, $n = 35$. What is the plaintext M ?

UNIT-IV

1. List the main features of SHA-512 cryptographic hash function. What kind of compression function is used in SHA-512?
2. Explain Message Authentication Requirements and what are the attacks related to message communication?
3. What is HMAC function? Summarize the design objectives of HMAC.
4. Explain about Elgamal Digital Signature Scheme.
5. What are the approaches of message authentication? Discuss briefly.
6. Discuss about the message exchange mechanism in Kerberos version 4.
7. Write general format of PGP message with a pictorial representation and explain. How PGP used for E-mail security?
8. Describe the functionalities of Internet Key Exchange Protocol.

9. Explain the operation of PGP along with key rings.
10. Explain different Key distribution Approaches of Message Authentication.
11. In what ways can a hash value be secured so as to provide message authentication?
12. Explain the following:
 - a) Pretty Good Privacy
 - b) S/MIME
13. Discuss in detail about Authentication Header.
14. Explain different authentication protocols.

UNIT-V

1. Is it possible in SSL for the receiver to recorder SSL record blocks that arrive out of order? If so, explain how it can be done. If not, why not?
2. What is SSL? Explain about SSL record protocol format.
3. Enumerate the functionalities of Secure Shell.
4. Explain the web security requirements for
 - a) TSL
 - b) TLS
5. What are the characteristics of X.509 Directory Authentication Services?
6. What is Intrusion Detection System (IDS)? Briefly explain its types.
7. Discuss about trusted systems.
8. Explain the design principles of Firewall.
9. Discuss about intrusion detection and approaches of intrusion detection
10. Explain various firewall configurations.
11. Explain in detail virus structure? Explain how a compression virus propagates?

(2) QUESTION BANK – GATE

Not Applicable

(11) - Two case study presentations with Project / Product/ Model /prototypes/ Industrial applications:

1. Design and Implementation Steganography System by Using Visible Image

Steganography refers to the technique of concealing secret information into another cover media, such as audio, video, image and text in such a manner that the very existence of the information is camouflaged while secret is kept from the knowing of attacker. Watermarking is closely related to Stenography except that it hides information in cover object. Watermarking usually serves the purpose of copyright protection and ownership authentication, for example, watermarking can hide a stego image inside a visible image and user can retrieve the stego-image and secret image in some way. In this paper, we will integrate two algorithms of information hiding, (steganography) F4 algorithm and (visible image) LSB algorithm to improve the level of protection. The secret image is concealed inside a common image through F4 algorithm and the resultant F4 steg-image is then hidden again as a visible image or watermark inside another image by LSB algorithm. To provide more than one level of protection for the hidden message, we will require additional security level to protect the secret image, which leads to increased complexity of retrieving the secrete

image. The results prove the success of system after the secret image is retrieved successfully. The value of MSE, SNR and PSNR is calculated, which refers to an acceptable steganography system.

2. The application of data encryption technology in computer network security

People rely more and more on network security. Therefore, this paper proposes a research on the application of computer network communication security based on data encryption technology. Use data encryption technology to design distributed data access, optimize multi-authorization center attribute data encryption technology; establish multi-authorization center attribute data encryption model, establish security initialization function, and optimize multi-authorization center attribute data encryption technology. Find various application forms and application fields of data encryption technology in computer network security, and conduct research and analysis.

(12) - Assignment Question sets:

MID 1

SET 1

1. What is the difference between passive and active threats?
2. Explain triple DES Algorithm with an example
3. Differentiate between RC5 and blowfish.
4. Explain the differences between DES and Triple DES algorithm
5. Enumerate Diffie-Hellman Key exchange for encryption and decryption with suitable examples.

SET 2

1. Describe the model for network security with neat sketch.
2. How is steganography different from Cryptography? Will it result in better security combining the two? If so, how? If not, why?
3. Describe about conventional encryption algorithms.
4. Enumerate in detail about the steps in Blow Fish Algorithm and explain the process of each round with a neat diagram.
5. Critically analyze the security of RSA.

SET 3

1. List and briefly define categories of Security Services and attacks.
2. Differentiate IDEA and DES algorithm.
3. Explain different Key distribution Approaches of Message Authentication.
4. Explain Traffic confidentiality.
5. Summarize the public key cryptographic principles. Explain RSA algorithm for given example, where $p = 3$ and $q = 11$.

MID 2

SET 1

1. Explain fermat's and Euler's Theorem in brief.

2. Explain Message Authentication Requirements and what are the attacks related to message communication?
3. Explain the following:
 - a. Pretty Good Privacy
 - b. S/MIME
4. Explain various firewall configurations.
5. What is SSL? Explain about SSL record protocol format.

SET 2

1. In a public-key system using RSA, you intercept the cipher text $C = 10$ sent to a user whose public key is $e = 5$, $n = 35$. What is the plaintext M ?
2. Describe the functionalities of Internet Key Exchange Protocol.
3. Discuss in detail about Authentication Header.
4. Enumerate the functionalities of Secure Shell.
5. Explain in detail virus structure? Explain how a compression virus propagates?

SET 3

1. Explain the Discrete logarithms in BER Theory
2. What is HMAC function? Summarize the design objectives of HMAC.
3. Explain different Key distribution Approaches of Message Authentication.
4. What is Intrusion Detection System (IDS)? Briefly explain its types.
5. Discuss about trusted systems.

(13) - List of topics for students Seminars

1. Password Hashing and Puzzling
2. Security Attacks in Vehicular Ad hoc Network
3. A Zero Trust Approach to Network Security
4. Diverse Types Of Network Attacks and the Describing Security Mechanisms
5. Integration of Antivirus With Virtual Private Network for Personal Systems Security
6. Strengthening Network Security: An SDN (Software Defined Networking) Approach
7. Network Security and Detection in Cloud-Based Environment Systems
8. Hiding Computer Network Proactive Security Tools Unmasking Features

(14) - STEP/Course material in softcopy



course material.rar

(15) - Expert Lectures with topics & Schedules (if any)

S.NO	SUBJECT	TOPIC	YEAR	RESOURCE PERSON	DATE

1	NS&C – EL01	Public key cryptography	IV-II	Others	Feb,2024
2	NS&C- EL02	Intrusion Detection System	IV-II	Others	March.,2024