

**Academic Regulations
Programme Structure
and
Detailed Syllabus**

**Bachelor of Technology
(B.Tech)
in
Electrical & Electronics Engineering**
(Four Year Regular Programme)

(Applicable for Batches admitted from 2022-23)



**GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Bachupally, Kukatpally, Hyderabad- 500 090**

**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
HYDERABAD**

**Academic Regulations for B.Tech (Regular) under GR22
(Applicable for Batches Admitted from 2022-23)**

Under Graduate Degree Programme in Engineering and Technology (UG)

Gokaraju Rangaraju Institute of Engineering and Technology (GRIET) offers a 4-year (8 Semesters) Bachelor of Technology (B.Tech) degree programme. The following programmes are offered in GRIET.

S.No	Department	Programme Code	Programme
1	Civil Engineering	01	B.Tech Civil Engineering
2	Electrical and Electronics Engineering	02	B.Tech Electrical and Electronics Engineering
3	Mechanical Engineering	03	B.Tech Mechanical Engineering
4	Electronics and Communication Engineering	04	B.Tech Electronics and Communication Engineering
5	Computer Science and Engineering	05	B.Tech Computer Science and Engineering
6	Information Technology	12	B.Tech Information Technology
7	Computer Science and Business System	32	B.Tech Computer Science & Business System
8	Computer Science and Engineering (AIML)	66	B.Tech Computer Science and Engineering (AIML)
9	Computer Science and Engineering (Data Science)	67	B.Tech Computer Science and Engineering (Data Science)
10	Computer Science and Engineering (Artificial Intelligence)		B.Tech Computer Science and Engineering (Artificial Intelligence)
11	Computer Science and Information Technology	33	B.Tech Computer Science and Information Technology

GR22 Regulations shall govern the above programmes offered by the Departments with effect from the students admitted to the programmes in 2022-23 academic year is given below.

- 1. Medium of Instruction:** The medium of instruction (including examinations and reports) is English.
- 2. Admissions:** Admission to the undergraduate (UG) Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the Telangana State Government/JNTUH University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the Government/University or on the basis of any other order of merit approved by the Government/University, subject to reservations as prescribed by the Government/University from time to time.
- 3. Programme Pattern:**
 - a) Each Academic Year of study is divided into two semesters.
 - b) Minimum number of instruction days in each semester is 90.
 - c) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
 - d) The total credits for the Programme are 160.
 - e) A student has a choice to register for all courses in a semester / one less or one additional course from other semesters provided the student satisfies prerequisites.
 - f) All the registered credits except Mandatory and Value Added Courses will be considered for the calculation of final CGPA.
 - g) Each semester has 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC, and course structure as suggested by AICTE are followed. The terms 'subject' and 'course' imply the same meaning.
 - h) **Course Classification:** All courses offered for all undergraduate programmes in B.Tech degree programmes are broadly classified as follows.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	BS	Basic Science	Includes Basic Science Courses
2	ES	Engineering Science	Includes Engineering Courses
3	HS	Humanities and Social Sciences	Includes Management Courses
4	PC	Professional Core	Includes Core Courses related to the parent discipline/department/ branch of Engineering
5	PE	Professional Elective	Includes Elective Courses related to the parent discipline/ department/ branch of Engineering
6	OE	Open Elective	Elective Courses from other technical and/or emerging subjects
7	PW	Project Work	Project work, seminar and internship in industry or elsewhere
8	MC	Mandatory Courses	Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge, Co and Extra Curricular Activities
9	VAC	Value Added Courses	Courses on current industry relevant topics improving breadth and depth in domain

4. Award of B.Tech Degree: The Undergraduate Degree of B.Tech shall be conferred by Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, on the students who are admitted to the programme and fulfill all the following academic requirements for the award of the degree

- a) A student pursues the course of study and completes it successfully in not less than four academic years and not more than eight academic years.
- b) A student has to register for all the 160 credits and secure all credits (with CGPA \geq 5).
- c) A student must fulfill all the academic requirements for the award of the degree.

5. Attendance Requirements:

- a) A student shall be eligible to appear for the semester-end examinations if he/she puts in a minimum of 75% of attendance in aggregate in all the courses concerned in the semester.
- b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in a semester may be granted. A committee headed by Dean (Academic Affairs) shall be the deciding authority for granting the condonation.
- c) Students who have been granted condonation shall pay a fee as decided by the Finance Committee.
- d) Shortage of Attendance more than 10% (attendance less than 65% in aggregate) shall in no case be condoned.
- e) Students whose shortage of attendance is not condoned in any semester are detained and are not eligible to take their end examinations of that semester. **They get detained and their registration for that semester shall stand cancelled**, including all academic credentials (internal marks etc.,) of that semester. **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 reregistered 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.

6. Paper Setting, Evaluation of Answer Scripts, Marks and Assessment:

- a) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council from time to time.
- b) **Distribution and Weightage of marks**

S.No	Components	Internal	External	Total
1	Theory	40	60	100
2	Practical	40	60	100
3	Graphics for Engineers	40	60	100
4	Mini Project	40	60	100
5	Project Work	40	60	100

- c) **Continuous Internal Evaluation and Semester End Examinations:** The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The marks for each of the component of assessment are fixed as shown in the following Table.

Assessment Procedure:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Theory	40	Internal Examination & Continuous Evaluation	<p>1) Two mid semester examination shall be conducted for 30 marks each for a duration of 120 minutes. Average of the two mid exams shall be considered</p> <p>i) Subjective – 20 marks ii) Objective – 10 marks</p> <p>2) Continuous Evaluation is for each unit using</p> <p>i) Assignment – 05 marks ii) Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks</p>
		60	Semester end examination	The semester-end examination is for a duration of 3 hours
2	Practical	40	Internal Examination & Continuous Evaluation	<p>One internal lab examination towards the end of course for a duration of 90 minutes with a viva of 5 minutes.</p> <p>i) Internal Exam-10 marks ii) Viva voce – 10 marks iii) Continuous Assessment- 10 marks iv) G-Lab on Board(G-LOB) (Case study inter threading of all experiments of lab)/ Laboratory Project/Prototype Presentation/App Development -10 marks</p>
		60	Semester end examination	<p>The semester-end examination is for a duration of 3 hours.</p> <p>i) write-up (algorithm/flowchart/procedure) as per the task/experiment/program - 10 marks ii) task/experiment/program-15 marks iii) evaluation of results -15 marks iv) write-up (algorithm/flowchart/procedure) for another task/experiment/program- 10 marks v) viva-voce on concerned laboratory course - 10 marks</p>

3	Graphics for Engineers	40	Internal Examination & Continuous Evaluation	<ol style="list-style-type: none"> 1) Two mid semester examination shall be conducted for 15 marks each for a duration of 90 minutes. Average of the two mid exams shall be considered 2) Day-to-Day activity -15 marks 3) Continuous Evaluation using <ul style="list-style-type: none"> • Assignment – 05 marks • Quiz/Subject Viva-voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject – 05 marks
		60	Semester end examination	The semester-end examination is for a duration of 3 hours

d) Mini Project:

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Mini Project	40	Continuous Evaluation & Internal Evaluation	<ol style="list-style-type: none"> 1) The supervisor continuously assesses the students for 20 marks <ol style="list-style-type: none"> i) Continuous Assessment – 15 marks <ul style="list-style-type: none"> • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation - 3 marks ii) Report – 5 marks 2) At the end of the semester, Mini Project shall be displayed in the road show at the department level. Mini Project is evaluated by Mini Project Review Committee for 10 marks. 3) Technical Event Participation in project area/MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/ Book Publication – 10 marks
		60	External Evaluation	The mini project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 60 marks .

Note:

- i) Mini Project Review Committee consists of HoD, Mini Project Coordinator and Supervisor.
- ii) Plagiarism check is compulsory for mini project report as per the plagiarism policy of GRIET.

e) **Internship/Skill Development Course/ Industrial Training:** Internship/Skill Development Course/Industrial Training shall be done by the student immediately after II-Year II Semester Examinations and pursue it during summer vacation/semester break & during III Year without effecting regular course work. Internship/Skill Development Course/Industrial Training at reputed organization shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination.

f) **Project Work (Phase-I and Phase-II):**

S. No	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Examinations
1	Project Work (Phase- I and Phase -II)	40	Continuous Evaluation & Internal Evaluation	1) The supervisor continuously assesses the students for 20 marks i) Continuous Assessment – 15 marks <ul style="list-style-type: none"> • Abstract Presentation - 3 marks • Architectural Design Presentation - 3 marks • Modules Presentation - 3 marks • Execution Cycle 1 Presentation - 3 marks • Execution Cycle 2 Presentation – 3 marks ii) Report – 5 marks
		60	External Evaluation	2) At the end of the semester, Project work shall be displayed in the road show at the department level. Project work is evaluated by Project Review Committee for 10 marks . 3) Technical Event Participation in project area/ MOOCs Course in project area/ Paper Publication/Publishing or Granting of a Patent/Hackathon participation/Book Publication – 10 marks . The Project report shall be presented before Project Review Committee in the presence of External Examiner and the same is evaluated for 60 marks .

Note:

- i) Project Review Committee consists of HoD, Project Coordinator and Supervisor.
 - ii) Plagiarism check is compulsory for project work report (Phase I and Phase II) as per the plagiarism policy of GRIET.
 - iii) The above rules are applicable for both Phase I and Phase II.
- g) The evaluation of courses having ONLY internal marks in I-Year I Semester and II Semester is as follows:
- I Year courses: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.
 - II Year II Semester *Real-Time/Field-based Research Project/Societal Related Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he/she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.
7. **Recounting of Marks in the End Examination Answer Books:** A student can request for recounting of his/her answer book on payment of a prescribed fee.
8. **Re-evaluation of the End Examination Answer Books:** A student can request for re-evaluation of his/her answer book on payment of a prescribed fee.
9. **Supplementary Examinations:** A student who has failed to secure the required credits can register for a supplementary examination, as per the schedule announced by the College for a prescribed fee.
10. **Malpractices in Examinations:** Disciplinary action shall be taken in case of malpractices during Mid/ End-examinations as per the rules framed by the Academic Council.
11. **Re-registration for mid examination:** A student shall be given one time chance to re-register for a maximum of two subjects in a semester:
- If the internal marks secured by a student in Continuous Internal Evaluation marks for 40 (sum of average of 2 mid-term examinations, average of all assignments and Subject Viva-voce/ PPT/Poster Presentation/Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork when the course is offered next, it could be semester for first years and a year for others.

In the event of the student taking this chance, his/her Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

12. Academic Requirements and Promotion Rules:

- a) 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% (14 marks out of 40), not less than 35% (21 marks out of 60 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.

The student is eligible to write Semester End Examination of the concerned subject/course if the student scores $\geq 35\%$ (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject/course but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his/her performance in that subject/course in SEE shall stand cancelled inspite of appearing the SEE.

- b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

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 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	(i) Regular course of study of Second year second semester (ii) Must have secured at least 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	(i) Regular course of study of Third year second semester. (ii) Must have secured at least 60% credits upto 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 year second semester	Regular course of study of Fourth year first semester.

- c) Provision of opting 2 OE courses through online mode.
- d) Choice of placement-oriented value-added courses in every semester from II year till IV year
- e) Students can take a year break after second or third year to work on R&D
- f) Under Mandatory Courses
 - i) **Co-Curricular activities** -- 0.5 credit for publishing paper, publishing patent, attend seminar, technical competition and taking part in hackathon
 - ii) **Extra-Curricular activities** -- 0.5 credit for sports represent University or part or college winning team a medal or cup in outside recognized inter collegiate or above tournaments or NSS activities or donated blood two times or 2 green campus events

13. **Grade Points:** A 10 - point grading system with corresponding letter grades and percentage of marks, as given below, is followed

Letter Grade	Grade Point	Percentage of marks
O (Outstanding)	10	Marks \geq 90
A+ (Excellent)	9	Marks \geq 80 and Marks $<$ 90
A (Very Good)	8	Marks \geq 70 and Marks $<$ 80
B+ (Good)	7	Marks \geq 60 and Marks $<$ 70
B (Average)	6	Marks \geq 50 and Marks $<$ 60
C (Pass)	5	Marks \geq 40 and Marks $<$ 50
F (Fail)	0	Marks $<$ 40
Ab (Absent)	0	

Letter grade 'F' in any Course implies failure of the student in that course and no credits of the above table are earned.

Computation of SGPA and CGPA:

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- i) **S_k** the SGPA of **kth** semester (1 to 8) is the ratio of sum of the product of the number of credits and grade points to the total credits of all courses registered by a student, i.e.,

$$SGPA (S_k) = \frac{\sum_{i=1}^n (C_i * G_i)}{\sum_{i=1}^n C_i}$$

Where **C_i** is the number of credits of the **ith** course and **G_i** is the grade point scored by the student in the **ith** course and **n** is the number of courses registered in that semester.

- ii) The CGPA is calculated in the same manner taking into account all the courses **m**, registered by student over all the semesters of a programme, i.e., up to and inclusive of **S_k**, where **k ≥ 2**.

$$CGPA = \frac{\sum_{i=1}^m (C_i * G_i)}{\sum_{i=1}^m C_i}$$

- iii) The SGPA and CGPA shall be rounded off to 2 decimal points.

14. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 160 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA >= 8.00 with no F or below grade/detention anytime during the programme
2	First Class	CGPA >= 8.00 with rest of the clauses of S.No 1 not satisfied
3	First Class	CGPA ≥ 6.50 and CGPA < 8.00
4	Second Class	CGPA ≥ 5.50 and CGPA < 6.50
5	Pass Class	CGPA ≥ 5.00 and CGPA < 5.50

Equivalence of grade to marks

$$\text{Marks \%} = (\text{CGPA} - 0.5) * 10$$

15. Award of 2-Year B.Tech Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B. Tech. – II Year – II Semester if the student want to exit the 4-Year B. Tech. program and requests for the 2-Year B.Tech (UG) Diploma Certificate.
2. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year – I Semester and continue for completion

of remaining years of study for 4-Year B. Tech. Degree. ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.

3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.
4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

16. Withholding of Results: If the student has not paid dues to the Institute/ University, or if any case of indiscipline is pending against the student, the result of the student (for that Semester) may be withheld and the student will not be allowed to go into the next semester. The award or issue of the Degree may also be withheld in such cases.

17. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of GR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of GR22 Regulations and he is required to complete the study of B.Tech programme within the stipulated period of eight academic years from the date of first admission in I Year.
2. A student who has been detained in any semester of II, III and IV years of GR20 regulations for want of attendance, shall be permitted to join the corresponding semester of GR22 Regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The GR22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of GR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of GR22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both GR20 & GR22 regulations. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The GR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in GR22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including GR22 Regulations. **There is NO exemption of credits in any case.**
6. If a student is readmitted to GR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in GR22 Regulations

will be substituted by another subject to be suggested by the college academic administration.

Note:

If a student readmitted to GR22 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in GR22 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

18. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges / Universities:

- a) Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis.
- b) There shall be no branch transfers after the completion of admission process.
- c) The students seeking transfer to GRIET from various other Universities/institutions have to pass the failed courses which are equivalent to the courses of GRIET, and also pass the courses of GRIET which the students have not studied at the earlier institution. Further, though the students have passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GRIET, the students have to study those courses in GRIET in spite of the fact that those courses are repeated.
- d) The transferred students from other Universities/institutions to GRIET who are on rolls are to be provided one chance to write the CBT (internal marks) in the **equivalent course(s)** as per the clearance (equivalence) letter issued by the University.

19. General Rules

- a. The academic regulations should be read as a whole for the purpose of any interpretation.
- b. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
- c. In case of any error in the above rules and regulations, the decision of the Academic Council is final.
- d. The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

Academic Regulations for B.Tech (Lateral Entry) under GR22
(Applicable for Batches Admitted from 2023-24)

1. All regulations as applicable for B.Tech 4-year degree programme (Regular) will hold good for B.Tech (Lateral Entry Scheme) except for the following rules:
 - a) Pursued programme of study for not less than three academic years and not more than six academic years.
 - b) A student should register for all 120 credits and secure all credits. The marks obtained in all 120 credits shall be considered for the calculation of the final CGPA.
 - c) Students who fail to fulfil all the academic requirements for the award of the degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.

2. Academic Requirements and Promotion Rules:

- a) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or laboratories if he/she secures not less than 35% of marks in the Semester-end Examination and a minimum of 40% of the sum total of the Internal Evaluation and Semester-end Examination taken together.
- b) A student shall be promoted to the next year only when he/she satisfies the requirements of all the previous semesters.

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.	(i) Regular course of study of Second year second semester. (ii) Must have secured at least 50% 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 to Fourth year first semester.	(i) Regular course of study of Third year second semester. (ii) Must have secured at least 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.

3. **Award of Class:** After a student satisfies all the requirements prescribed for the completion of the Degree and becomes eligible for the award of B.Tech Degree by JNTUH, he/she shall be placed in one of the following four classes based on CGPA secured from the 120 credits.

S. No	Class Awarded	CGPA Secured
1	First Class with Distinction	CGPA \geq 8.00 with no F or below grade/ detention anytime during the Programme
2	First Class	CGPA \geq 8.00 with rest of the clauses of S.no 1 not satisfied
3	First Class	CGPA \geq 6.50 and CGPA $<$ 8.00
4	Second Class	CGPA \geq 5.50 and CGPA $<$ 6.50
5	Pass Class	CGPA \geq 5.00 and CGPA $<$ 5.50

Academic Regulations for B.Tech with Minors Programme under GR22 (Applicable for Batches Admitted from 2022-23)

1. Objectives

The key objectives of offering B. Tech. with Minor program are:

- To expand the domain knowledge of the students in one of the other programmes of engineering.
- To increase the employability of undergraduate students keeping in view of better opportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the interdisciplinary areas in addition to their own programme of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

2. Academic Regulations for B.Tech Degree with Minor programmes

- a) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4 -Years B.Tech programme.
- b) For B.Tech with Minor, a student needs to earn additional 18 credits (over and above the required 160 credits for B.Tech degree). All these 18 credits need to be completed in III year and IV year only.
- c) After registering for the Minor programme, if a student is unable to earn all the required 18 credits in a specified duration (twice the duration of the course), he/she shall not be awarded Minor degree. However, if the student earns all the required 160 credits of B.Tech, he/she will be awarded only B.Tech degree in the concerned programme.
- d) There is no transfer of credits from Minor programme courses to regular B.Tech degree course and vice versa.
- e) These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCS platform.
- f) For the course selected under MOOCS platform following guidelines may be followed:
 - i) Prior to registration of MOOCS courses, formal approval of the courses, by the University is essential. University before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.
 - ii) Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure provided by the University.
 - iii) Only Pass-grade/marks or above shall be considered for inclusion of grades in minor grade memo.
 - iv) Any expenses incurred for the MOOCS courses are to be met by the students only.
- g) The option to take a Minor programme is purely the choice of the student.
- h) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor programme at any time; and in that case the student will be awarded only B.Tech degree in the concerned programme on earning the required credits of 160.
- i) The student can choose only one Minor programme along with his/her basic engineering degree. A student who chooses an Honors programme is not eligible to choose a Minor programme and vice-versa.
- j) A student can graduate with a Minor if he/she fulfils the requirements for his/her regular B.Tech programme as well as fulfils the requirements for Minor programme.

- k) The institute shall maintain a record of students registered and pursuing their Minor programmes, minor programme-wise and parent programme -wise. The same report needs to be sent to the University once the enrolment process is complete.
- l) The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

3. Eligibility conditions for the student to register for Minor programme

- a) A student can opt for B.Tech programme with Minor programme if she/he has no active backlogs till II Year I Semester (III semester) at the time of entering into III year I semester.
- b) Prior approval of mentor and Head of the Department for the enrolment into Minor programme, before commencement of III year I Semester (V Semester), is mandatory
- c) If more than 50% of the students in a programme fulfil the eligibility criteria (as stated above), the number of students given eligibility should be limited to 50%.

4. Registration for the courses in Minor Programme

- a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.
- b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech programme. No course should be identical to that of the regular B.Tech course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.
- c) The maximum No. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.
- d) The registration fee to be collected from the students by the College is **Rs. 1000/-** per one credit.
- e) A fee for late registration may be imposed as per the norms.

5. Minor courses and the offering departments

S. No.	Minor Programme	Eligible programme of students	@Offering Department	Award of Degree
1.	Artificial Intelligence & Machine Learning	All programmes, except B.Tech in CSE (AI&ML) /B.Tech (AI&ML)/ B.Tech (AI)/ B.Tech CSE(AI)	CSE	“B.Tech in programme name with Minor in Artificial Intelligence & Machine Learning”



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Autonomous) Bachupally, Kukatpally, Hyderabad-500090, India. (040)65864440

ELECTRICAL AND ELECTRONICS ENGINEERING

B. Tech (EEE) – GR22 Course Structure

I B. Tech (EEE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A1001	Linear Algebra and Function Approximation	3	1	0	4	3	1	0	4	40	60	100
2	Chemistry	BS	GR22A1005	Engineering Chemistry	3	1	0	4	3	1	0	4	40	60	100
3	EEE	ES	GR22A1009	Basic Electrical Engineering	2	1	0	3	2	1	0	3	40	60	100
4	CSE	ES	GR22A1007	Programming for Problem Solving	2	1	0	3	2	1	0	3	40	60	100
5	EEE	ES	GR22A1018	Basic Electrical Engineering Lab	0	0	1	1	0	0	2	2	40	60	100
6	Chemistry	BS	GR22A1015	Engineering Chemistry Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	CSE	ES	GR22A1017	Programming for Problem Solving Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	ME	ES	GR22A1021	Engineering Workshop	1	0	1.5	2.5	1	0	3	4	40	60	100
TOTAL					11	4	5.5	20.5	11	4	11	26	320	480	800
9	Mgmt	MC	GR22A1022	Design Thinking	0	0	0	0	2	0	0	2	40	60	100

I B. Tech (EEE) - II Semester

S. No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A1002	Differential Equations and Vector Calculus	3	1	0	4	3	1	0	4	40	60	100
2	Physics	BS	GR22A1003	Applied Physics	3	1	0	4	3	1	0	4	40	60	100
3	English	HS	GR22A1006	English	2	0	0	2	2	0	0	2	40	60	100
4	CSE	ES	GR22A1012	Data Structures	2	1	0	3	2	1	0	3	40	60	100
5	Physics	BS	GR22A1013	Applied Physics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
6	ME	ES	GR22A1011	Graphics for Engineers	1	0	2	3	1	0	4	5	40	60	100
7	CSE	ES	GR22A1020	Data Structures Lab	0	0	1	1	0	0	2	2	40	60	100
8	English	HS	GR22A1016	English Language and Communication Skills Lab	0	0	1	1	0	0	2	2	40	60	100
TOTAL					11	3	5.5	19.5	11	3	11	25	320	480	800

II B.Tech(EEE) - I Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	Maths	BS	GR22A2009	Computational Mathematics for Engineers	3	0	0	3	3	0	0	3	40	60	100
2	EEE	PC	GR22A2024	Electrical Circuit Analysis	2	1	0	3	2	1	0	3	40	60	100
3	EEE	PC	GR22A2025	Principles of Analog Electronics	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PC	GR22A2026	DC Machines and Transformers	3	0	0	3	3	0	0	3	40	60	100
5	EEE	PC	GR22A2027	Electromagnetic Fields	3	0	0	3	3	0	0	3	40	60	100
6	CSE	PC	GR22A2007	Data Base for Engineers	2	0	0	2	2	0	0	2	40	60	100
7	EEE	PC	GR22A2028	Principles of Analog Electronics Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	EEE	PC	GR22A2029	DC Machines and Transformers Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
			TOTAL		16	1	3	20	16	1	6	23	320	480	800
9	Mgmt	MC	GR22A2003	Constitution of India	0	0	0	0	2	0	0	2	40	60	100
10	Mgmt	MC	GR22A2002	Value Ethics and Gender Culture	0	0	0	0	2	0	0	2	40	60	100

II B.Tech (EEE) - II Semester

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC	GR22A2030	Power Generation and Transmission	3	0	0	3	3	0	0	3	40	60	100
2	EEE	PC	GR22A2031	AC Machines	2	1	0	3	2	1	0	3	40	60	100
3	EEE	PC	GR22A2032	Control Systems	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PC	GR22A2033	Principles of Digital Electronics	3	0	0	3	3	0	0	3	40	60	100
5	EEE	PC	GR22A2034	Microprocessors and Microcontrollers	2	0	0	2	2	0	0	2	40	60	100
6	EEE	PC	GR22A2035	Principles of Digital Electronics Lab	0	0	2	2	0	0	4	4	40	60	100
7	EEE	PC	GR22A2036	AC Machines Lab	0	0	2	2	0	0	4	4	40	60	100
8	EEE	PC	GR22A2037	Control Systems Lab	0	0	2	2	0	0	4	4	40	60	100
			TOTAL		13	1	6	20	13	1	12	26	320	480	800
9	Chemistry	MC	GR22A2001	Environmental Science	0	0	0	0	2	0	0	2	40	60	100
10	CSE	MC	GR22A2008	Java Programming for Engineers	0	0	0	0	2	0	0	2	40	60	100
11	English	MC	GR22A2108	Effective Technical Communication	0	0	0	0	2	0	0	2	40	60	100
12	EEE	MC	GR22A2109	Real-time Research Project/ Societal Related Project	0	0	2	2	0	0	4	4	50	--	50

III YEAR I SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC		Power System Analysis	2	1	0	3	2	1	0	3	40	60	100
2	EEE	PC		Power Electronics	3	0	0	3	3	0	0	3	40	60	100
3	EEE	PC		Power Distribution and Protection	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective I	3	0	0	3	3	0	0	3	40	60	100
5	EEE	OE		Open Elective I	3	0	0	3	3	0	0	3	40	60	100
6	EEE	PC		Power Systems Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	EEE	PC		Power Electronics Lab	0	0	2	2	0	0	4	4	40	60	100
8	EEE	PC		Microprocessors and Microcontrollers Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
TOTAL					14	1	5	20	14	1	10	25	320	480	800

Professional Elective –I			
S.No	BOS	Course Code	Course Name
1	EEE		Electrical and Hybrid Vehicles
2	EEE		Solar and Wind Energy Systems
3	EEE		Electrical Machine Design
4	MECH		Optimization Techniques

Open Elective I			
S.No.	BOS	Course Code	COURSE
1	EEE		Non-Conventional Energy Sources

III YEAR II SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC		Fundamentals of Digital Signal Processing	3	0	0	3	3	0	0	3	40	60	100
2	EEE	PC		Sensors Measurements and Instrumentation	2	1	0	3	2	1	0	3	40	60	100
3	Mgnt	HS		Economics and Accounting for Engineers	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PE		Professional Elective II	3	0	0	3	3	0	0	3	40	60	100
5	EEE	OE		Open Elective II	3	0	0	3	3	0	0	3	40	60	100
6	EEE	PC		Power System Analysis Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
7	EEE	PC		Sensors Measurements and Instrumentation Lab	0	0	1.5	1.5	0	0	3	3	40	60	100
8	EEE	PW		Mini Project with Seminar	0	0	2	2	0	0	4	4	40	60	100
TOTAL					14	1	5	20	14	1	10	25	320	480	800

Professional Elective -II			
S.No	BOS	Course Code	Course Name
1	EEE		Modern Power Electronics
2	EEE		HVDC Transmission Systems
3	EEE		Advanced Control Systems
4	CSE		Operating Systems

Open Elective II			
S.No.	BOS	Course Code	COURSE
1	CSE		Machine Learning

IV YEAR I SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	PC	ES		Power Semiconductor Drives	2	1	0	3	2	1	0	3	40	60	100
2	EEE	PE		Professional Elective III	3	0	0	3	3	0	0	3	40	60	100
3	EEE	PE		Professional Elective IV	3	0	0	3	3	0	0	3	40	60	100
4	Mgmt	HS		Fundamentals of Management and Entrepreneurship	3	0	0	3	3	0	0	3	40	60	100
5	EEE	OE		Open Elective III	3	0	0	3	3	0	0	3	40	60	100
6	EEE	PC		DSP Lab	0	0	2	2	0	0	4	4	40	60	100
7	EEE	PC		Power Semiconductor Drives Lab	0	0	2	2	0	0	4	4	40	60	100
8	EEE	PW		Project Work Phase-I	0	0	6	6	0	0	12	12	40	60	100
TOTAL					14	1	10	25	14	1	20	35	320	480	800

Professional Elective -III			
S.No	BOS	Course Code	Course Name
1	EEE		Wide Band Gap Power Devices
2	EEE		High Voltage Engineering
3	EEE		Digital Control Systems
4	EEE		Industrial Automation
Professional Elective -IV			
S.No	BOS	Course Code	Course Name
1	EEE		Power Quality and FACTS
2	EEE		Electrical Energy Audit
3	EEE		Special Electrical Machines
4	ECE		VLSI Design

Open Elective III			
S.No.	BOS	Course Code	COURSE
1	EEE		Artificial Intelligence Techniques (/IoT)

IV YEAR II SEMESTER

S.No	BOS	Group	Course Code	Course Name	Credits				Hours				Int.	Ext	Total Marks
					L	T	P	Total	L	T	P	Total			
1	EEE	PC		Power System Monitoring and Control	2	1	0	3	2	1	0	3	40	60	100
2	EEE	PE		Professional Elective V	3	0	0	3	3	0	0	3	40	60	100
3	EEE	PE		Professional Elective VI	3	0	0	3	3	0	0	3	40	60	100
4	EEE	PW		Project Work Phase-II	0	0	6	6	0	0	12	12	40	60	100
TOTAL					8	1	6	15	8	1	12	21	160	240	400

Professional Elective -V			
S.No	BOS	Course Code	Course Name
1	EEE		Advanced Electric Drives
2	EEE		Big Data Applications in Power Systems
3	EEE		Modern Control Theory
4	EEE		Industrial IoT
Professional Elective -VI			
S.No	BOS	Course Code	Course Name
1	EEE		PCB Design
2	EEE		Electric Smart Grid
3	ECE		Embedded Systems
4	CSE		Big Data Analytics

PROFESSIONAL ELECTIVES – 4 THREADS

S. No.	Thread 1: Power Electronics	Thread 2: Power Systems	Thread 3: Machines and Control Systems	Thread 4: Computer and Electronics
1	Electrical and Hybrid Vehicles	Solar and Wind Energy Systems	Electrical Machine Design	Optimization Techniques
2	Modern Power Electronics	HVDC Transmission Systems	Advanced Control Systems	Operating Systems
3	Wide Band Gap Power Devices	High Voltage Engineering	Digital Control Systems	Industrial Automation
4	Power Quality and FACTS	Electrical Energy Audit	Special Electrical Machines	VLSI Design
5	Advanced Electric Drives	Big Data Applications in Power Systems	Modern Control Theory	Industrial IoT
6	PCB Design	Electric Smart Grid	Embedded Systems	Big Data Analytics

OPEN ELECTIVES FOR GR22 REGULATIONS

THREAD 1	THREAD 2	OFFERED BY
1. Soft Skills and Interpersonal Communication 2. Human Resource Development And Organizational Behavior 3. Cyber Law and Ethics 4. Economic Policies in India	1. Principles of E-Commerce 2. Business Analytics 3. Augmented Reality and Virtual Reality	CSE
	1. Internet of Things 2. Augmented Reality and Virtual Reality 3. Human Computer Interaction	CSE(AIML)
	1. Augmented Reality and Virtual Reality 2. Internet of Things 3. Human Computer Interaction	CSE (DS)
	1. Services Science and Service Operational Management 2. IT Project Management 3. Marketing Research and Marketing Management	CSBS
	1. Artificial Intelligence 2. Introduction to Data Science 3. Human Computer Interaction	IT
	1. Non-Conventional Energy Sources 2. Machine Learning 3. Artificial Intelligence Techniques	EEE
	1. Principles of Communication 2. Sensor Technology 3. Cellular and Mobile Communications	ECE
	1. Robotics 2. Composite Materials 3. Operations Research	ME
	1. Engineering Materials for Sustainability 2. Geographic Information Systems and Science 3. Environmental Impact Assessment and Life Cycle Analyses	CE