Study & Evaluation Scheme

of

Bachelor of Technology
(Electrical Engineering)

[Applicable w.e.f. Academic Session - 2020-21 till revised]

[As per CBCS guidelines given by AICTE]

TEERTHANKER MAHAVEER UNIVERSITY

N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001

Website: www.tmu.ac.in

Study & Evaluation Scheme	
SUMMARY	
Institute Name	*Faculty of Engineering*
Programme	*B.Tech (Electrical Engineering)*
Duration	*Four-year full time (Eight Semesters)*
Medium	*English*
Minimum Required Attendance	*75%*
Credits	
Maximum Credits	*180*
Minimum Credits Required for Degree	*172*

Assessment:					
Evaluation			**Internal**	**External**	**Total**
Theory			40	60	100
Practical/ Dissertations/ Project Reports/ Viva-Voce			50	50	100
Class Test-1	**Class Test-2**	**Class Test-3**	**Assignment(s)**	**Attendance & Participation**	**Total**
Best two out of three					
10	10	10	10	10	40
Duration of Examination			**External**	**Internal**	
			3 Hours	1.5 Hours	

To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teachers continuous evaluation (i.e. both internal and external).A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.

 # Provision for delivery of 25% content through online mode.
 # Policy regarding promoting the students from semester to semester & year to year. No specific condition to earn the credit for promoting the students from one semester to next semester.
 # Maximum no of years required to complete the program: N+2 (N=No of years for program)

Question Paper Structure	
1	*The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.*
2	*Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.*
3	*The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.*
IMPORTANT NOTES:	
1	*The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).*
2	*Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.*
3	*There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.*

Program Structure- B.Tech. (Electrical Engineering)

A. Introduction:

An undergraduate degree programme in Electrical Engineering aims to provide students with a solid foundation in the underlying principles of electrical engineering before students move forward and decide on a specialisation in an area of interest later in the course. The course will comprise of a range of learning modes- laboratory work tutorials, lectures, project work and individual research. On average, bachelors will take four years. Electrical Engineering seeks to understand the application of electricity, electronics and electromagnetism in the multitude of devices that we use. This means from the everyday appliance such as the kitchen blender, to circuit boards and space equipment. Students will look at the design and production of electrical and electronic systems.

Students will develop and gain various skills that are transferable within the engineering world and practical skills that are equally useful in plenty of other sectors. Problem-solving skills are honed, and their interpersonal and communication skills will also improve with the amount of team work that they will be required to do. Students will also learn how to better manage their time and resources and assess the risks involved in a certain project. Other useful skills that they will learn include design, leadership and organisational skills.

The institute emphasis on the following courses *balanced with core and elective courses:* The curriculum of B.Tech. Program emphasizes an intensive, flexible engineering education with 130 credits of core courses (all types), 38 credits of electives and 12 credits of field/internship projects. Total 180 credits are allotted for the B.Tech. degree.

The programme structure and credits for B.Tech. are finalized based on the stakeholders' requirements and general structure of the programme. Minimum number of classroom contact teaching credits for the B.Tech. program will be 168 credits (one credit equals 1.0 hour) and Project/internship will be of 12 credits. However, the minimum number of the credits for award of B.Tech. degree will be 172 credits. Out of 168 credits of classroom contact teaching, 46 credits are to be allotted for core courses (CC), 16 credits are allotted to Basic Science Courses (BSC), 35 credits are allotted to Engineering Science Courses (ESC), 03 credits are allotted to Mandatory Courses(MC),06 credits are allotted to open elective courses (OEC),14 credits are allotted to Humanities and Social Sciences including Management courses (HSMC), 24 credits are allotted to Professional Elective courses and rest of 24 credits for Laboratory courses. Credits distribution is given below in tabular form:

B.Tech. Electrical Engineering: Four-Year (8-Semester) CBCS Programme			
Basic Structure: Distribution of Courses			
S. No.	**Type of Course**	**Credit Hours**	**Total Credits**
1	BSC - Basic Science Courses	4 Courses of 4 Credits each (Total Credit Hrs. 4X4)	16
2	ESC - Engineering Science Courses	8 Courses of 4 Credits each (Total Credit Hrs. 8X4) 1 Courses of 3 Credits each (Total Credit Hrs. 1X3)	35
3	HSMC - Humanities and Social Sciences including Management courses	4 Courses of 3 Credits each (Total Credit Hrs. 4X3) 1 Courses of 2 Credits each (Total Credit Hrs. 1X2)	14
4	PCC - Professional core courses	6 Courses of 3 Credits each (Total Credit Hrs. 6X3) 7 Courses of 4 Credits each (Total Credit Hrs. 7X4)	46
5	PEC - Professional Elective courses	5 Courses of 4 Credits each (Total Credit Hrs. 5X4) 1 Courses of 3 Credits each (Total Credit Hrs. 1X3) 1 Course of 1 Credits each (Total Credit Hrs. 1X1)	24
6	OEC - Open Elective courses	2 Course of 3 Credits each (Total Credit Hrs.2X3)	06
7	Value Added Course (VAC)	6 Courses of 0 Credits each (Total Credit Hrs. 6X0)	0
8	LC - Laboratory course	16 Courses of 1 Credits each (Total Credit Hrs. 16X1) 4 Courses of 2 Credits each (Total Credit Hrs. 4X2)	24
9	MC-Mandatory Courses	1 Course of 3 Credits each (Total Credit Hrs.1X3)	03
10	PROJ-Skill based practical training & Industrial Training Report & Viva Voce for Dissertation	1 Course of 5 Credits each (Total Credit Hrs. 1X5) 1 Course of 3 Credits each (Total Credit Hrs. 1X3) 2 Course of 2 Credits each (Total Credit Hrs. 2X2)	12
11	MOOC-Optional (credits will consider only in case a student fails to secure minimum required credits for the award of degree)	4 Course of 0 Credits each (Total Credit Hrs. 4X0)	00
Total Credits			**180**

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

B. Tech (Honours) Programme:

A new academic programme B.Tech (Hons.) is introduced in order to facilitate the students to choose additionally the specialized courses of their choices and build their competence in a specialized area. The features of the new programme, include:

1. B.Tech Student in regular stream can opt for B.Tech (Hons.), provided he/she passed in all courses with minimum aggregate 75% marks upto the end of second semester.
2. For B. Tech (Hons), Student needs to earn additional 24 credits (over and above the required minimum 180 credits) relevant to her/his discipline as recommended by the faculty advisor.
3. The students opting for this program have to take four additional courses of their specialization of a minimum of 2 credits each from 3rd to 8th semesters.

4. The faculty advisor will suggest the additional courses to be taken by the students based on their choice and level of their academic competence.
5. The list of such additional courses offered by the NPTEL will be approved by the Honourable Vice Chancellor in the beginning of the academic year to facilitate the registration process.
6. The student can also opt for post graduate level courses.
7. The students have to submit the NPTEL course completion certificate to exam division for considering as B.Tech (Hons)

* Student should have to take permission of registration for the B.Tech. (Hons.) degree from Honourable Vice Chancellor in starting of third semester.

B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his/her target number of credits as specified by the AICTE/UGC and adopted by our University.

The following is the course module designed for the B.Tech. program:

- ***Program Core Course (PCC):*** Core courses of B.Tech. program will provide a holistic approach to engineering education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.
  The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the society at large.
  A wide range of core courses provides groundwork in the basic engineering disciplines: Electrical Machines (Motors, Generators, and Transformers), Power Generation/Transmission/Distribution Systems etc.
  The integrated foundation is important for students because it will not only allow them to build upon existing skills, but they can also explore career options in a range of industries, and expand their understanding of various Technical fields.
  We offer core courses from semester III onwards during the B.Tech. program. There will be 2, 3 and 4 credits for each core course offered.
- ***HSMC – (Humanities and Social Sciences including Management courses):*** As per the AICTE guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the ***Humanities and Social Sciences including Management courses*** are actually Ability Enhancement Compulsory Course (AECC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offered four HSMCs of 3 credits in I, II, III, V, VI semesters.
- ***Skill Enhancement Course:*** This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. We offer two SECs course as Lab- one each in VI Semester & VII Semester. One SEC will carry 2 credits each.
- ***Open Elective Course (OEC):*** Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in VII and VIII semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

- ***Mandatory Course (MC):*** This is a compulsory course that does not have any choice and will be of 3 credits. Each student of B.Tech Program has to compulsorily pass the Environmental Studies and acquire 3 credits.

- ***Value Added Course (VAC):*** A Value Added Course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester III, IV, V & VI semesters and two courses of Soft Skills in V &VI Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

- ***Professional Elective courses (PEC):*** The professional elective course is chosen to make students specialist or having specialized knowledge of a specific domain like Power system, Control system etc. It will be covered in three semesters (VI, VII & VIII) of Third and fourth years of the program relevant to chosen disciplines of core courses of the program. Each student will have to choose eight professional elective courses (PECs); 2 in Semester VI, 2 in Semester VII and 4 in Semester VIII respectively.

C. Program Outcomes for Engineering:

PO – 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO – 2	**Problem analysis& Solving:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO – 3	**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.
PO – 4	**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.
PO – 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO – 6	**Social Interaction & effective citizenship:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO – 7	**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.
PO – 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO – 9	**Attitude (Individual and team work):** Function effectively as an individual, and as member or leader in diverse teams, and in multidisciplinary settings.
PO – 10	**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 clean instructions.
PO – 11	**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.
PO – 12	**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.
PO-13	**Entrepreneurship:** An Entrepreneurship cut across every sector of human life including the field of engineering, engineering entrepreneurship is the process of harnessing the business opportunities in engineering and turning it into profitable commercially viable innovation.
PO-14	**Interpersonal skills:** Interpersonal skills involve the ability to communicate and build relationships with others. Effective interpersonal skills can help the students during the job interview process and can have a positive impact on your career advancement.
PO-15	**Technology savvy/usage:** Being technology savvy is essentially one's skill to be smart with technology. This skill reaches far beyond 'understanding' the concepts of how technology works and encompasses the 'utilization' of such modern technology for the purpose of enhancing productivity and efficiency.

D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developed by the end of four-year **Bachelor of Technology in Electrical Engineering Program:**

PSO – 1	**Understanding** the basics of electrical systems that efficiently generate, transmit, distribute and utilize electrical power.
PSO – 2	**Applying** various software tools to specify, design, implement and test analog & digital signal processing based electrical/electronic systems using the state of the art components.
PSO – 3	**Analysing** and designing electrical machinery, electrical/electronic circuits, electrical/solid state drive systems, lighting systems.
PSO – 4	**Analysing**, designing and implementing the state of art in electrical instrumentation, control and automation applications.
PSO – 5	**Analysing** and Designing Solar System, Electrical vehicle, Internet of Things based applications.
PSO – 6	**Designing** and implementing electrical, electronics & allied interdisciplinary projects to meet the demands of industry and to provide solutions to the real time problems.

E. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning.

- ***Audio-Visual Based Learning:*** These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through video lectures. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through Audio visual Aids is a good idea and method. The learning becomes really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting *Audio-Visual Based Learning* wherever possible.

- ***Field / Live Projects*:** The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other than their regular classes.

- ***Industrial Visits:*** Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

- ***MOOCs:*** Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs.

  University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

  Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.
  For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

  a) This is recommended for every student to take at least one MOOC Course throughout the programme.
  b) There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
  c) The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.
  d) Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.
  e) After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.
  f) Marks will be considered which is mentioned on Completion certificate of MOOC Course.
  g) College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

- ***Special Guest Lectures (SGL) & Extra Mural Lectures (EML):*** Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

- ***Student Development Programs (SDP):*** Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

- ***Industry focused programs:*** Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice based insight to the students.

- ***Special assistance program for slow learners & fast learners:*** There is a provision of identify slow learners; develop the mechanism to correcting knowledge gap through result analysis of various class tests. Extra classes will be arranged for slow learners and facilitate them with required study material. There are some terms of advance topics what learning challenging it will be provided to the fast learners.

- ***Induction program:*** Every year 3 weeks induction program is organized for 1st year students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

- **Mentoring scheme:** There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

- **Extra-curricular Activities:** organizing& participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

- **Career & Personal Counseling:** - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change.
  Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.
  Strategies: a) Once in a week the counselors meet the students in order to inquire about problems. b) Available 24x7 on SOS basis.

- **Participation in Workshops, Seminars & writing & Presenting Papers:** Departments plan to organize the workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. These participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as noncredit course.
- **Formation of Student Clubs, Membership &Organizing& Participating events:** Every department has the departmental clubs with the specific club name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

- **Capability Enhancement & Development Schemes:** The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

- **Library Visit & Utilization of E-Learning Resources:** Student can visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.
  a) Institute Library & Information is subscribing online e-books and e-journals databases (DELNET and EBSCO host E-databases) as per the requirement of the institute and fulfilling AICTE norms. IP based access is given to all computers connected on campus LAN to access e-journals.
  b) For the effective utilisation of resources, Information Literacy training programs are conducted to the staff and students.
  c) Wi-Fi enabled campus
  d) Regular addition of latest books and journals
  e) Well maintained e-library to access e-resources

Study & Evaluation Scheme

B.Tech (Electrical Engineering)-Semester I

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BSC-1	EAS116	Engineering Mathematics-I	3	1	-	4	40	60	100
2	BSC-2	EAS112	Engineering Physics	3	1	-	4	40	60	100
		EAS113	Engineering Chemistry							
3	ESC-1	EEE117	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC111	Basic Electronics Engineering							
4	MC-1	TMU101	Environmental Studies	2	1	-	3	40	60	100
5	HSMC-1	TMUGE101	English Communication- I	2	-	2	3	40	60	100
6	LC-1	EAS162	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS163	Engineering Chemistry (Lab)							
7	LC-2	EEE161	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC161	Basic Electronics Engineering (Lab)							
8	LC-3	EME161	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME162	Workshop Practice (Lab)							
9	DGP-1	EGP111	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**13**	**4**	**10**	**22**	**350**	**450**	**800**

B.Tech (Electrical Engineering)-Semester II

S. No	Category	Course Code	Course	Periods			Credit	Evaluation Scheme		
				L	T	P		Internal	External	Total
1	BSC-3	EAS211	Engineering Mathematics-II	3	1	-	4	40	60	100
2	BSC-4	EAS212	Engineering Physics	3	1	-	4	40	60	100
		EAS213	Engineering Chemistry							
3	ESC-2	EEE217	Basic Electrical Engineering	3	1	-	4	40	60	100
		EEC211	Basic Electronics Engineering							
4	ESC-3	ECS212	Computer System & Programming in C++	3	-	-	3	40	60	100
5	HSMC-2	TMUGE201	English Communication- II	2	-	2	3	40	60	100
6	LC-4	EAS262	Engineering Physics (Lab)	-	-	2	1	50	50	100
		EAS263	Engineering Chemistry (Lab)							
7	LC-5	EEE261	Basic Electrical Engineering (Lab)	-	-	2	1	50	50	100
		EEC261	Basic Electronics Engineering (Lab)							
8	LC-6	ECS262	Computer System &Programming in C++ (Lab)	-	-	2	1	50	50	100
9	LC-7	EME261	Engineering Drawing (Lab)	-	-	4	2	50	50	100
		EME262	Workshop Practice (Lab)							
10	DGP-2	EGP211	Discipline & General Proficiency	-	-	-	-	100	-	100
			Total	**14**	**3**	**12**	**23**	**400**	**500**	**900**

B.Tech (Electrical Engineering)-Semester III

S. No	*Category*	*Course Code*	Course	*Periods*			*Evaluation Scheme*			
				L	*T*	*P*	*Credit*	*Internal*	*External*	*Total*
1	PCC-1	EEE311	Electrical Machines – I	3	-	-	3	40	60	100
2	PCC-2	EEE312	Circuit Theory	3	-	-	3	40	60	100
3	ESC-4	EEC311	Engineering Electromagnetics	3	1	-	4	40	60	100
4	ESC-5	EEC312	Digital Logic & Circuits	3	1	-	4	40	60	100
5	ESC-6	EEC315	Signals & Systems	3	1	-	4	40	60	100
6	HSMC-3	TMUGE301	English Communication- III	2	-	2	3	40	60	100
7	LC-8	EEE361	Electrical Machines – I (Lab)	-	-	2	1	50	50	100
8	LC-9	EEC361	Digital Logic & Circuits (Lab)	-	-	2	1	50	50	100
9	DGP-3	EGP311	Discipline & General Proficiency	**-**	**-**	**-**	**-**	100	-	100
			Total	**17**	**3**	**6**	**23**	**340**	**460**	**800**

Following additional Course for Lateral Entry Students with B.Sc./Polytechnic background to be taken in III semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	LC	EME161/261	Engineering Drawing (Lab)	-	-	4	-	50	50	100
2		TMU101	Environmental Studies	2	1	-	-	40	60	100

Value Added Course:
It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

1	VAC-1	TMUGA-301	Foundation in Quantitative Aptitude	2	1	-	-	40	60	100

B.Tech (Electrical Engineering)-Semester IV

S. No	*Category*	*Course Code*	Course	*Periods*			*Evaluation Scheme*			
				L	*T*	*P*	*Credit*	*Internal*	*External*	*Total*
1	PCC-3	EEE411	Electrical Machines – II	3	1	-	4	40	60	100
2	PCC-4	EEE412	Electrical Measurements and Measuring Instruments	3	-	-	3	40	60	100
3	PCC-5	EEE413	Network Analysis & Synthesis	3	1	-	4	40	60	100
4	ESC-7	ECS412	Object oriented Programming using JAVA	3	1	-	4	40	60	100
5	LC-10	EEE461	Electrical Machines – II (Lab)	-	-	2	1	50	50	100
6	LC-11	EEE462	Electrical Measurements and Measuring Instruments (Lab)	-	-	2	1	50	50	100
7	LC-12	EEE463	Network Analysis &Synthesis (Lab)	-	-	2	1	50	50	100
8	LC-13	ECS461	Object oriented Programming using JAVA (Lab)	-	-	2	1	50	50	100
9	DGP-4	EGP411	Discipline & General Proficiency	**-**	**-**	**-**	**-**	100	-	100
			Total	**12**	**3**	**8**	**19**	**360**	**440**	**800**

*Skill based Training/Internship of 4 weeks duration from a reputed Industry/organization after completion of 4th semester end-semester examination.

Following additional Courses for Lateral Entry Students with B.Sc./Polytechnic background to be taken in IV semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added

1	LC	EME162/262	Workshop Practice (Lab)	-	-	4	-	50	50	100

***Value Added Course:**

1	VAC-2	TMUGA-401	Analytical Reasoning	2	1	-	-	40	60	100

B.Tech (Electrical Engineering)-Semester V

S. No	*Category*	*Course Code*	Course	*Periods*			*Evaluation Scheme*			
				L	*T*	*P*	*Credit*	*Internal*	*External*	*Total*
1	PCC-6	EEE511	Control Systems	3	1	-	4	40	60	100
2	PCC-7	EEE512	Power Electronics	3	1	-	4	40	60	100
3	PCC-8	EEE513	Power System Analysis-I	3	-	-	3	40	60	100
4	HSMC-4	TMUGE501	English Communication- IV	2	-	2	3	40	60	100
5	ESC-8	EEC511	Microprocessor & Applications	3	1	-	4	40	60	100
6	LC-14	EEE561	Control Systems (Lab)	-	-	2	1	50	50	100
7	LC-15	EEE562	Power Electronics (Lab)	-	-	2	1	50	50	100
8	LC-16	EEC561	Microprocessor & Applications (Lab)	-	-	2	1	50	50	100
9	PROJ-1	EEE592	Skill based Practical Training & Presentation	-	-	-	2	50	50	100
10	DGP-5	EGP511	Discipline & General Proficiency	**-**	**-**	**-**	**-**	100	-	100
			Total	**14**	**3**	**8**	**23**	**400**	**500**	**900**

***Value Added Course:**

1	VAC-3	TMUGA-501	Modern Algebra and Data Management	2	1	-	-	40	60	100
2	VAC-4	TMUGS-501	Managing Self	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-1	MOOC01	MOOC Program -I (Optional)	-	-	-	2	-	100	100

B.Tech (Electrical Engineering)-Semester VI

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-9	EEE611	Electrical Drives & Controls		3	1	-	4	40	60	100
2	PCC-10	EEE612	Power System Analysis-II		3	1	-	4	40	60	100
3	PEC-1		Program Elective	Program Elective-I	3	1	-	4	40	60	100
4	PEC-2			Program Elective-II	3	1	-	4	40	60	100
5	ESC-9	EEC619	Analog and Digital Communication System		3	1	-	4	40	60	100
6	HSMC-5	EHM613	Human values & Professional Ethics		2	-	-	2	40	60	100
7	LC-17	EEE661	Electrical Drives & Controls (Lab)		-	-	2	1	50	50	100
8	LC-18	EEE665	Modelling & Simulation using MATLAB-Simulink (Lab)		-	1	2	2	50	50	100
9	DGP-6	EGP611	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**17**	**6**	**4**	**25**	**340**	**460**	**800**

*Industrial Training of 6 weeks duration from a reputed Industry/organization after completion of 6th semester end-semester examination.

***Value Added Course:**

1	VAC-5	TMUGA-601	Advance Algebra and Geometry	2	1	-	-	40	60	100
2	VAC-6	TMUGS-601	Managing Work and Others	2	1	-	-	50	50	100

MOOC Course:

1	MOOC-2	MOOC02	MOOC Program –II (Optional)	-	-	-	2	-	100	100

B.Tech (Electrical Engineering)-Semester VII

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-11	EEE711	Switchgear & Protection		3	-	-	3	40	60	100
2	PCC-12	EEE712	Non-Conventional Energy Resources		3	-	-	3	40	60	100
3	PEC-3		Program Elective	Program Elective-III	3	1	-	4	40	60	100
4	PEC-4			Program Elective-IV	3		-	3	40	60	100
5	OEC-1		Open Elective	Open Elective-I	3	-	-	3	40/50	60/50	100
6	LC-19	EEE761	Switchgear & Protection (Lab)		-	-	2	1	50	50	100
7	LC-20	EEC761	Electronics Devices & Circuits (Lab)		-	-	4	2	50	50	100
		EEC762	Design and installation of Solar Photovoltaic System (Lab)		-	1	2				
8	PROJ-2	EEE792	Industrial Training & Presentation		-	-	-	2	50	50	100
9	PROJ-3	EEE798	Project Work Phase-1		-	-	10	5	100	-	100
10	DGP-7	EGP711	Discipline & General Proficiency		-	-	-	-	100	-	100
			Total		**15**	**1/2**	**16/14**	**26**	**450/460**	**450/440**	**900**

MOOC Course:

1	MOOC-3	MOOC03	MOOC Program –III (Optional)	-	-	-	2	-	100	100

B.Tech (Electrical Engineering)-Semester VIII

S. No	Category	Course Code	Course		Periods			Evaluation Scheme			
					L	T	P	Credit	Internal	External	Total
1	PCC-13	EEE811	Electric Power System Operation		3	1	-	4	40	60	100
2	PEC-5		Program Elective	Program Elective-V	3	1	-	4	40	60	100
3	PEC-6			Program Elective-VI	3	1	-	4	40	60	100
4	PEC-7		Program Elective (Lab)	Program Elective-VII	-	-	2	1	50	50	100
5	OEC-2		Open Elective	Open Elective-II	3	-	-	3	40/50	60/50	100
6	PROJ-4	EEE898	Project Work Phase –II		-	-	6	3	50	50	100
7	DGP-8	EGP811	Discipline & General Proficiency		**-**	**-**	**-**	**-**	100	-	100
			Total		**15**	**-**	**08**	**19**	**260/270**	**340/330**	**600**

MOOC Course:

1	MOOC-4	MOOC04	MOOC Program –IV (Optional)	-	-	-	2	-	100	100

ELECTIVE COURSES OFFERED

S. No	Code	Course	L	T	P	Credit
Semester VI - Program Elective I -(Any one)						
Specialization: Signal Processing						
1	EEC612	Embedded System	3	1	0	4
2	EEC617	Microcontroller Hardware, Programming & its Application (Arduino)	3	1	0	4
Semester VI - Program Elective II -(Any one)						
Specialization: Soft Computing Techniques						
3	EEE620	Artificial Neural Network	3	1	0	4
4	EEE621	Advanced Control System	3	1	0	4
5	ECS611	Database Management System	3	1	0	4
6	ECS631	Network security & cryptography	3	1	0	4
Semester VII- Program Elective III -(Any one)						
Specialization: Power System Engineering						
7	EEE713	High Voltage Engineering	3	1	0	4
8	EEE714	Power Generation Systems	3	1	0	4
9	EEE720	Electric Vehicle	3	1	0	4
Semester VII- Program Elective IV -(Any one)						
Specialization: Industrial Management Theory						
10	EHM731	Principle of Management	3	0	0	3
11	EHM735	Industrial Sociology	3	0	0	3
12	EHM733	Organizational Behaviour	3	0	0	3
13	EHM734	Engineering and Managerial Economics	3	0	0	3
Semester VIII- Program Elective V -(Any one)						
Specialization: Semiconducting Devices and power Transmission						
15	EEE812	FACTS Technology	3	1	0	4
16	EEC814	Electronic Circuits	3	1	0	4
17	EEE821	EHV AC/DC Transmission	3	1	0	4
Semester VIII- Program Elective VI -(Any one)						
Specialization: Industrial application						
18	EEE831	Machine learning & Data Analytics	3	1	0	4
19	EHM832	Total Quality Management	3	1	0	4
20	EHM833	Entrepreneurship	3	1	0	4
Semester VIII- Program Elective VII (Lab) -(Any one)						
21	EEE861	Power System Simulation (Lab)	0	0	2	1
22	EEC864	Electronic Circuits (Lab)	0	0	2	1

Course Code: EAS116	B.Tech- Semester-I **Engineering Mathematics-I**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of eigenvalues and eigenvectors, Optimization & derivatives of functions of several variables, partial and total differentiation, implicit functions.	
CO2.	**Understanding** the concepts of curl and divergence of vector field.	
CO3.	**Understanding** of Green's theorem, Gauss Theorem, and Stokes theorem.	
CO4.	**Applying** the concept of Leibnitz's theorem for successive derivatives.	
CO5.	**Analyzing** the intangibility of a differential equation to find the optimal solution of first order first degree equations.	
CO6.	**Evaluating** the double integration and triple integration using Cartesian, polar co-ordinates and the concept of Jacobian of transformation.	
Course Content:		
Unit-1:	**Determinants**- Rules of computation; Linear Equations and Cramer's rule. **Matrices:** Elementary row and column transformation; Rank of matrix; Linear dependence; Consistency of linear system of equations; Characteristic equation; Cayley-Hamilton Theorem (without proof); Eigen values and Eigen vectors; Complex and Unitary matrices.	**8 Hours**
Unit-2:	**Differential Equation--**First order first degree Differential equation: variable separable, Homogeneous method, Linear differential equation method, Exact Differential equation.	**8 Hours**
Unit-3:	**Differential Calculus:** Leibnitz theorem; Partial differentiation; Euler's theorem; Change of variables; Expansion of function of several variables, Jacobians, Error function.	**8 Hours**
Unit-4:	**Multiple Integrals:** Double integral, Triple integral, Beta and Gamma functions; Dirichlet theorem for three variables, Liouville's Extension of Dirichlet theorem.	**8 Hours**
Unit-5:	**Vector Differentiation:** Vector function, Differentiation of vectors, Formulae of Differentiation, Scalar and Vector point function, Geometrical Meaning of Gradient, Normal and Directional Derivative, Divergence of a vector function, Curl of a vector **Vector Integration:** Green's theorem, Stokes' theorem; Gauss' divergence theorem.	**8 Hours**
Text Books:	1. Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers.	
Reference Books:	1. Kreyszig E., *Advanced Engineering Mathematics*, Wiley Eastern. 2. Piskunov N, *Differential & Integral Calculus*, Moscow Peace Publishers. 3. Narayan Shanti, *A Text book of Matrices*, S. Chand ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=EGnI8WyYb3o 2. https://www.youtube.com/watch?v=ksS_yOK1vtk&list=PLbRMhDVUMngfIrZCNOyPZwHUU1pP66vQW	

Course Code: EAS112	B.Tech- Semester-I **Engineering Physics**	L-3 T-1 P-0 C-4
Course Outcomes :	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basic concepts of interference, diffraction and polarisation.	
CO2.	**Understanding** the concept of bonding in solids and semiconductors.	
CO3.	**Understanding** the special theory of relativity.	
CO4.	**Applying** special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.	
CO5.	**Applying** the concepts of polarized light by the Brewster's and Malus Law	
Course Content:		
Unit-1:	**Interference of Light:** Introduction, Principle of Superposition, and Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring.	**8 Hours**
Unit-2:	**Diffraction**: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope.	**8 Hours**
Unit-3:	**Polarization:** Introduction, production of plane polarized light by different methods, Brewster's and Malus Law. Quantitative description of double refraction, Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter.	**8 Hours**
Unit-4:	**Elements of Material Science:** Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers.	**8 Hours**
Unit-5:	**Special Theory of Relativity:** Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence.	**8 Hours**
Text Books:	**1.** Elements of Properties of Matter, D. S. Mathur, S. Chand & Co.	
Reference Books:	**1.** F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill. **2.** Concept of Modern Physics, Beiser, Tata McGraw-Hill. **3.** R. Resnick, Introduction to Special Relativity, John Wiley, Singapore. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**1.** https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338226CA **2.** https://www.youtube.com/watch?v=CuqsU7B1MtU	

Course Code: EAS162	B.Tech- Semester-I **Engineering Physics (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** of the operation of various models of optical devices.	
CO2.	**Understanding** types of Semiconductors using Hall experiments.	
CO3.	**Applying** the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer.	
CO4.	**Applying** the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus.	
CO5.	**Applying** the concept of resolving & dispersive power by a prism.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list:**	
1	To determine the wavelength of monochromatic light by Newton's ring.	
2	To determine the wavelength of monochromatic light by Michelson-Morley experiment.	
3	To determine the wavelength of monochromatic light by Fresnel's Bi-prism.To determine the Planck's constant using LEDs of different colours.	
4	To determine the Planck's constant using LEDs of different colours.	
5	To determine the specific rotation of cane sugar solution using Polarimeter	
6	To verify Stefan's Law by electrical method	
7	To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up	
8	To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment.	
9	To compare Illuminating Powers by a Photometer.	
10	To determine the frequency of A.C. mains by means of a Sonometer.	
11	To determine refractive index of a prism material by spectrometer	
12	To determine the Flashing & Quenching of Neon bulb.	
13	Determination of Cauchy's constant by using spectrometer.	
14	To study the PN junction characteristics	
15	To determine the resolving power and dispersive power by a prism	
16	To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode	
17	Study the characteristics of LDR	
18	To study the characteristics of a photo-cell.	
Books:	**1.** B.Sc. Practical Physics, Gupta and Kumar, Pragati Prakashan. **2.** B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd. ***Latest editions of all the suggested books are recommended.**	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EAS113	B.Tech- Semester-I **Engineering Chemistry**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of softening & purification of water.	
CO2.	**Understanding** calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.	
CO3.	**Understanding** the concept of lubrication, Properties of Refractory & Manufacturing of cements.	
CO4.	**Applying** the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.	
CO5.	**Applying** the concepts of spectroscopic & chromatographic techniques.	
Course Content:		
Unit-1:	**Water and Its Industrial Applications:** Sources, Impurities, Hardness and its units, Industrial water, characteristics, softening of water by various methods (External and Internal treatment), Boiler trouble causes effects and remedies, Characteristic of municipal water and its treatment, Numerical problem based on water softening method like lime soda, calgonetc	**8 Hours**
Unit-2:	**Fuels and Combustion:** Fossil fuel and classification, calorific value, determination of calorific value by Bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of by product, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number.	**8 Hours**
Unit-3:	**Lubricants:** Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories	**8 Hours**
Unit-4:	**Polymers:** Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6, Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S.	**8 Hours**
Unit-5:	**A. Instrumental Techniques in chemical analysis:** Introduction, Principle, Instrumentation and application of IR, NMR, UV, Visible, Gas Chromatography, Lambert and Beer's Law. **B. Water Analysis Techniques:** Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques.	**8 Hours**

Text Books:	**1.** Agarwal R. K., Engineering Chemistry, Krishna Prakashan.	
Reference Books:	**1.** Morrison & Boyd, Organic Chemistry, Prentice Hall **2.** Barrow Gordon M., Physical Chemistry, McGraw-Hill. **3.** Manahan Stanley E., Environmental Chemistry, CRC Press ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=RV-OyRTaIOI 2. https://www.youtube.com/watch?v=phhfkikb6Lw	

Course Code: EAS163	B.Tech- Semester-I **Engineering Chemistry (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Hardness of water.	
CO2.	**Analyzing** & estimating of various parameters of water.	
CO3.	**Analyzing** of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.	
CO4.	**Analyzing** of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus.	
CO5.	**Analyzing** of viscosity of lubricating oil using Redwood Viscometer.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	Determination of Total Hardness of a given water sample.	
2	Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate	
3	To determine the pH of the given solution using pH meter and pH-metric titration	
4	Determination of dissolved oxygen content of given water sample	
5	To find chemical oxygen demand of waste water sample by potassium dichromate	
6	Determination of free chlorine in a given water sample	
7	To determine the chloride content in the given water sample by Mohr's method	
8	To prepare the Bakelite resin polymer	
9	To determine the concentration of unknown sample of iron spectrophotometrically	
10	To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer	
11	To determine the flash & fire point of a given lubricating oil	
12	Determination of calorific value of a solid or liquid fuel.	
13	Determination of calorific value of a gaseous fuel	
14	Determination of % of O_2, CO_2, % CO in flue gas sample using Orsat apparatus.	
15	Proximate analysis of coal sample.	

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE117	B.Tech-Semester-I **Basic Electrical Engineering**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basics of Network, AC Waveform and its characteristics.	
CO2.	**Understanding** the basic concept of Measuring Instruments, Transformers & three phase Power systems.	
CO3.	**Understanding** the basic concepts of Transformer.	
CO4.	**Understanding** the basic concept of power measurement using two wattmeter methods.	
CO5.	**Applying** the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.	
Course Content:		
Unit-1:	**D.C. Network Theory:** Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorem, Star-delta & delta-star conversion.	**8 Hours**
Unit-2:	**Steady State Analysis of A.C. Circuits:** Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor.	**8 Hours**
Unit-3:	**Basics of Measuring Instruments:** Introduction to wattmeter & Energy meter extension range of voltmeter and ammeter. **Three Phase A.C. Circuits:** Line and phase voltage/current relations; three phase power, power measurement using two wattmeter methods.	**8 Hours**
Unit-4:	**Single phase Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses.	**8 Hours**
Unit-5:	**Electrical machines:** DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)	**8 Hours**
Text Books:	**1.** Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill	
Reference Books:	**1.** Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. **2.** A Grabel, Basic Electrical Engineering, McGraw Hill. **3.** Cotton H., Advanced Electrical Technology, Wheeler Publishing. 4. Del Toro, Principles of Electrical Engineering, Prentice-Hall International. **5.** W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	• https://nptel.ac.in/courses/108/108/108108076/ • https://sites.google.com/tmu.ac.in/dr-garima-goswami/home	

Course Code: EEE161	B.Tech- Semester-I **Basic Electrical Engineering (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Kirchoff & Voltage law.	
CO2.	**Understanding** the concepts of dc network theorem.	
CO3.	**Analyzing** the energy by a single-phase energy meter.	
CO4.	**Analyzing** the losses and efficiency of Transformer on different load conditions.	
CO5.	**Analyzing** the electrical circuits using electrical and electronics components on bread board.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	To verify the Kirchhoff's current and voltage laws.	
2	To study multimeter.	
3	To verify the Superposition theorem	
4	To verify the Thevenin's theorem.	
5	To verify the Norton's theorem.	
6	To verify the maximum power transfer theorem	
7	To verify current division and voltage division rule.	
8	To measure energy by a single-phase energy meter	
9	To measure the power factor in an RLC by varying the capacitance	
10	To determine resonance frequency, quality factor, bandwidth in series resonance	
11	To measure the power in a 3-phase system by two-wattmeter method	
12	To measure speed for speed control of D.C. Shunt Motor	
13	To determine the efficiency of single-phase transformer by load test.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC111	B.Tech- Semester-I **Basic Electronics Engineering**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of electronic components like diode, BJT & FET.	
CO2.	**Understanding** the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers	
CO3.	**Understanding** the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.	
CO4.	**Understanding** the concepts of number system, Boolean algebra and logic gates.	
CO5.	**Applying** the knowledge of series, parallel and electromagnetic circuits.	
Course Content:		
Unit-1:	**p-n Junction:** Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator	**8 Hours**
Unit-2:	**Bipolar Junction Transistor (BJT):** Basic construction, transistor action; CB, CE and CC configurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias	**8 Hours**
Unit-3:	**Field Effect Transistor (FET):** Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self-biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics.	**8 Hours**
Unit-4:	**Operational Amplifier (Op-Amp):** Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator.	**8 Hours**
Unit-5:	**Switching Theory:** Number system, conversion of bases (decimal, binary, octal and hexadecimalnumbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth table- AND, OR & NOT, Seven segment display & K map.	**8 Hours**
Text Books:	**1.** Robert Boylestad & Louis Nashelsky, Electronic Circuit and Devices, Pearson India.	
Reference Books:	**1.** Sedra and Smith, Microelectronic Circuits, Oxford University Press. **2.** Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd. **3.** Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=USrY0JspDEg 2. https://www.youtube.com/watch?v=Hkz27cFW4Xs	

Course Code: EEC161	B.Tech- Semester-I **Basic Electronics Engineering (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the implementation of diode-based circuits.	
CO2.	**Understanding** the implementation of Operational amplifier-based circuits.	
CO3.	**Analyzing** the characteristics of pn junction diode & BJT.	
CO4.	**Analyzing** the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.	
CO5.	**Analyzing** the truth tables through the different type's adders.	
LIST OF EXPERIMENTS:	**Note: Minimum eight experiments should be performed-**	
1	To study the V-I characteristics of p-n junction diode.	
2	To study the diode as clipper and clamper	
3	To study the half-wave rectifier using silicon diode.	
4	To study the full-wave rectifier using silicon diode.	
5	To study the Zener diode as a shunt regulator.	
6	To study transistor in Common Base configuration & plot its input/output characteristics	
7	To study the operational amplifier in inverting & non-inverting modes using IC 741.	
8	To study the operational amplifier as differentiator & integrator.	
9	To study various logic gates & verify their truth tables.	
10	To study half adder/full adder & verify their truth tables	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: TMU101	B.Tech- Semester-I **Environmental Studies**	L-2 T-1 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** environmental problems arising due to constructional and developmental activities.	
CO2.	**Understanding** the natural resources and suitable methods for conservation of resources for sustainable development.	
CO3.	**Understanding** the importance of ecosystem and biodiversity and its conservation for maintaining ecological balance.	
CO4.	**Understanding** the types and adverse effects of various environmental pollutants and their abatement devices.	
CO5.	**Understanding** Greenhouse effect, various Environmental laws, impact of human population explosion, environment protection movements, different disasters and their management.	
Course Content:		
Unit-1:	Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development. **Ecology and Environment**: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, FoodChain, FoodWeb, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.	**8 Hours**
Unit-2:	**Natural Resources:** Renewable & Non-Renewable resources; Landre sources and landuse change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies. **Biodiversity:** Hot SpotsofBiodiversityinIndiaandWorld,Conservation,ImportanceandFactorsResponsibleforLossofBiodiversity,BiogeographicalClassification of India	**8 Hours**
Unit-3:	**Environmental Pollutions:** Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies	**8 Hours**
Unit-4:	**Environmental policies & practices: Climate change & Global** Warming (Green house Effect),Ozone Layer -Its Depletion and Control Measures, Photo chemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context	**8 Hours**
Unit-5:	Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study	**8 Hours**

Field Work:	**1.** Visit to an area to document environmental assets; river/forest/flora-fauna etc. **2.** Visit to a local polluted site: urban/rural/industrial/agricultural. **3.** Study of common plants, insects, birds & basic principles of identification. **4.** Study of simple ecosystem; pond, river etc.	
Text Books:	**1.** "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.	
Reference Books:	**1.** "Biodiversity and Conservation", Bryant, P. J., Hypertext Book **2.** "Textbook of Environment Studies", Tewari, Khulbe & Tewari,I.K Publication ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=8tamfocnHb8 2. https://www.youtube.com/watch?v=YlE1DDo25IQ	

Course Code: TMUGE101	B.Tech- Semester-I **English Communication – I**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering and understanding** of the basic of English grammar and vocabulary.	
CO2.	**Understanding** of the basic Communication process.	
CO3.	**Applying** correct vocabulary and tenses in sentences construction.	
CO4.	**Analyzing** communication needs and developing communication strategies using both verbal & non-verbal method.	
CO5.	**Drafting** applications in correct format for common issues.	
CO6.	**Developing** self-confidence.	
Course Content:		
Unit-1:	**Introductory Sessions** • Self-Introduction • Building Self Confidence: Identifying strengths and weakness, reasons Failure, strategies to overcome Fear of Failure • Importance of English Language in present scenario (Practice: Self-introduction session)	**6 Hours**
Unit-2:	**Basics of Grammar** • Parts of Speech • Tense • Subject and Predicate • Vocabulary: Synonym and Antonym (Practice: Conversation Practice)	**12 Hours**
Unit-3:	**Basics of Communication** • Communication: Process, Types, 7Cs of Communication, Importance & Barrier • Language as a tool of communication • Non-verbal communication: Body Language • Etiquette & Manners • Basic Problem Sounds (Practice: Pronunciation drill and building positive body language)	**10 Hours**
Unit-4:	**Application writing** • Format & Style of Application Writing • Practice of Application writing on common issues.	**8 Hours**
Unit-5:	**Value based text reading:** Short Story (Non- detailed study) • Gift of Magi - O. Henry	**4 Hours**
Text Books:	**1**. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi.	
Reference Books:	**1.** Kumar, Sanjay. & Pushp Lata. "Communication Skills" New Delhi: Oxford University Press. **2.** Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster. **3.** Goleman, Daniel. "Emotional Intelligence' Bantam Book. ***Latest editions of all the suggested books are recommended.**	

Additional electronics reference material:	**1.** https://www.youtube.com/watch?v=4XEa-8HD3lE **2.** https://www.youtube.com/watch?v=sb6ZZ2p3hEM&feature=youtu.be **3.** https://www.youtube.com/watch?v=Df3ysUkdB38 **4.** https://www.youtube.com/watch?v=0LdYaj3jcws **5.** https://www.youtube.com/watch?v=64XIkMqPm_8 **6.** https://www.youtube.com/watch?v=_vS6O8YlMq0	
Methodology:	**1.** Language Lab software. **2.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion. **3.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Telephone, Audio-Video Clips) **4.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized	

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		**100**
20 Marks (Best 2 out of Three CTs) ***(From Unit- II, IV & V)***	10 Marks (Oral Assignments) ***(From Unit I & III)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit II, IV & V)***	20 Marks (External Viva)* ***(From Unit -1 & III)***	

*Parameters of External Viva

Content	**Body Language**	**Confidence**	**Question Responsiveness**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: EME161	B.Tech- Semester-I **Engineering Drawing (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Engineering Drawing.	
CO2.	**Understanding** how to draw and represent the shape, size & specifications of physical objects.	
CO3.	**Applying** the principles of projection and sectioning.	
CO4.	**Applying** the concepts of development of the lateral surface of a given object.	
CO5.	**Creating** isometric projection of the given orthographic projection.	
LIST OF EXPERIMENTS:	**All to be performed**	
1	To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions.	
2	To draw the types of lines and conventions of different materials.	
3	To draw and study dimensioning and Tolerance	
4	To construction geometrical figures of Pentagon and Hexagon	
5	To draw the projection of points and lines	
6	To draw the Orthographic Projection of given object in First Angle	
7	To draw the Orthographic Projection of given object in Third Angle	
8	To draw the sectional view of a given object	
9	To draw the development of the lateral surface of given object	
10	To draw the isometric projection of the given orthographic projection.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Drawing Sheet (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: The drawing sheet could be manual or in Auto CAD.

Course Code: EME162	B.Tech- Semester-I **Workshop Practice (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts to prepare simple wooden joints using wood working tools.	
CO2.	**Applying** the techniques to produce fitting jobs of specified dimensions.	
CO3.	**Applying** the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.	
CO4.	**Applying** the concepts of black smithy and lathe machine to produce different jobs.	
CO5.	**Creating** core and moulds for casting.	
LIST OF EXPERIMENTS:	**Perform any ten experiments selecting at least one from each shop**	
1	**Carpentry Shop**: 1. To prepare half-lap corner joint. 2. To prepare mortise &tenon joint. 3. To prepare a cylindrical pattern on woodworking lathe.	
2	**Fitting Bench Working Shop:** 1. To prepare a V-joint fitting 2. To prepare a U-joint fitting 3. To prepare a internal thread in a plate with the help of tapping process	
3	**Black Smithy Shop:** 1. To prepare a square rod from given circular rod 2. To prepare a square U- shape from given circular rod	
4	**Welding Shop:** 1. To prepare a butt and Lap welded joints using arc welding machine. 2. To prepare a Lap welded joint Gas welding equipment. 3. To prepare a Lap welded joint using spot welding machine	
5	**Sheet-metal Shop:** 1. To make round duct of GI sheet using 'soldering' process. 2. To prepare a tray of GI by fabrication	
6	**Machine Shop:** 1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c. 2. To perform the following operations on Centre Lathe: Turning, Step turning, Taper turning, Facing, Grooving and Knurling 3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine.	
7	**Foundry Shop:** 1. To prepare core as per given size. 2. To prepare a mould for given casting.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EGP111	B.Tech- Semester-I **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: EAS211	B.Tech- Semester-II **Engineering Mathematics-II**	L-3 T-1 P-0 C-4
Course Outcomes :	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of the wave, diffusion and Laplace equations & Fourier series.	
CO2.	**Understanding** the methods of separation of variables.	
CO3.	**Understanding** the concepts of Fourier series' representation of single variable function.	
CO4.	**Applying** Laplace transform to determine the complete solutions of linear ODE.	
CO5.	**Applying** the method of variations of parameters to find solution of equations with variable coefficients.	
Course Content:		
Unit-1:	**Differential Equations:** Linear Differential Equation, Linear Differential Equation with constant coefficient: Complementary functions and particular integrals, Linear Differential Equation with variable coefficient: Removal method, changing independent variables, Method of variation of parameters, Homogeneous Linear Differential Equation, Simultaneous linear differential equations.	**8 Hours**
Unit-2:	**Series Solutions:** Power Series solutions of ODE, Ordinary Point, Singular Points, Frobenius Method. **Special Functions:** Legendre equation and Polynomial, Legendre Function, Rodrigue's formula, Laplace definite integral for first and second kind, Bessel equation and Polynomial, Bessel Function, Orthogonal properties and Recurrence Relation for Legendre and Bessel function.	**8 Hours**
Unit-3:	**Partial differential equations –**Method of separation of variables for solving partial differential equations; Wave equation up to two dimensions; Laplace equation in two-dimensions; Heat conduction equations up to two-dimensions; Equations of transmission Lines.	**8 Hours**
Unit-4:	**Fourier Series:** Periodic functions, Trigonometric series; Fourier series; Dirichlet's conditions, Determination of Fourier coefficient by Euler's formulae; Fourier series for discontinuous functions, Even and odd functions, Half range sine and cosine series.	**8 Hours**
Unit-5:	**Laplace Transform:** Laplace transform; Existence theorem; Laplace transform of derivatives and integrals; Inverse Laplace transform; Unit step function; Diratch delta function; Laplace transform of periodic functions; Convolution theorem.	**8 Hours**
Text Books:	**1.** Das H.K., Engineering Mathematics Vol-II, S. Chand.	
Reference Books:	**1.** Kreyszig E., Advanced Engineering Mathematics, Wiley Eastern. **2.** Piskunov N, Differential & Integral Calculus, Moscow Peace Publishers. **3.** Narayan Shanti, A Text book of Matrices, S. Chand **4.** Bali N.P., Engineering Mathematics-II, Laxmi Publications. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=luJMl37-nso **2.** https://www.youtube.com/watch?v=NdouX5-KD6Y	

Course Code: EAS212	B.Tech- Semester-II **Engineering Physics**	L-3 T-1 P-0 C-4
Course Outcomes :	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basic concepts of interference, diffraction and polarisation.	
CO2.	**Understanding** the concept of bonding in solids and semiconductors.	
CO3.	**Understanding** the special theory of relativity.	
CO4.	**Applying** special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc.	
CO5.	**Applying** the concepts of polarized light by the Brewster's and Malus Law.	
Course Content:		
Unit-1:	**Interference of Light:** Introduction, Principle of Superposition, and Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring.	**8 Hours**
Unit-2:	**Diffraction**: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope.	**8 Hours**
Unit-3:	**Polarization:** Introduction, production of plane polarized light by different methods, Brewster's and Malus Law. Quantitative description of double refraction, Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter.	**8 Hours**
Unit-4:	**Elements of Material Science:** Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers.	**8 Hours**
Unit-5:	**Special Theory of Relativity:** Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence.	**8 Hours**
Text Books:	1. Elements of Properties of Matter, D. S. Mathur, S. Chand & Co.	
Reference Books:	**1.** F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill. **2.** Concept of Modern Physics, Beiser, Tata McGraw-Hill. **3.** R. Resnick, Introduction to Special Relativity, John Wiley, Singapore. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**1.** https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338226CA **2.** https://www.youtube.com/watch?v=CuqsU7B1MtU	

Course Code: EAS262	B.Tech- Semester-II **Engineering Physics (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** of the operation of various models of optical devices.	
CO2.	**Understanding** types of Semiconductors using Hall experiments.	
CO3.	**Applying** the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer.	
CO4.	**Applying** the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus.	
CO5.	**Applying** the concept of resolving & dispersive power by a prism.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list:**	
1	To determine the wavelength of monochromatic light by Newton's ring.	
2	To determine the wavelength of monochromatic light by Michelson-Morley experiment.	
3	To determine the wavelength of monochromatic light by Fresnel's Bi-prism. To determine the Planck's constant using LEDs of different colours.	
4	To determine the Planck's constant using LEDs of different colours.	
5	To determine the specific rotation of cane sugar solution using Polarimeter	
6	To verify Stefan's Law by electrical method	
7	To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up	
8	To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment.	
9	To compare Illuminating Powers by a Photometer.	
10	To determine the frequency of A.C. mains by means of a Sonometer.	
11	To determine refractive index of a prism material by spectrometer	
12	To determine the Flashing & Quenching of Neon bulb.	
13	Determination of Cauchy's constant by using spectrometer.	
14	To study the PN junction characteristics	
15	To determine the resolving power and dispersive power by a prism	
16	To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode	
17	Study the characteristics of LDR	
18	To study the characteristics of a photo-cell.	
Books:	1. B.Sc. Practical Physics, Gupta and Kumar, Pragati Prakashan. 2. B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd. ***Latest editions of all the suggested books are recommended.**	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EAS213	B.Tech- Semester-II **Engineering Chemistry**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of softening & purification of water.	
CO2.	**Understanding** calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements.	
CO3.	**Understanding** the concept of lubrication, Properties of Refractory & Manufacturing of cements.	
CO4.	**Applying** the concepts of the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization.	
CO5.	**Applying** the concepts of spectroscopic & chromatographic techniques.	
Course Content:		
Unit-1:	**Water and Its Industrial Applications:** Sources, Impurities, Hardness and its units, Industrial water, characteristics, softening of water by various methods (External and Internal treatment), Boiler trouble causes effects and remedies, Characteristic of municipal water and its treatment, Numerical problem based on water softening method like lime soda, calgonetc	**8 Hours**
Unit-2:	**Fuels and Combustion:** Fossil fuel and classification, calorific value, determination of calorific value by Bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number.	**8 Hours**
Unit-3:	**Lubricants:** Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories.	**8 Hours**
Unit-4:	**Polymers:** Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6, Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S.	**8 Hours**
Unit-5:	**A. Instrumental Techniques in chemical analysis:** Introduction, Principle, Instrumentation and application of IR, NMR, UV, Visible, Gas Chromatography, Lambert and Beer's Law. **B. Water Analysis Techniques:** Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques.	**8 Hours**
Text Books:	**1.** Agarwal R. K., Engineering Chemistry, Krishna Prakashan.	
Reference Books:	**1.** Morrison & Boyd, Organic Chemistry, Prentice Hall **2.** Barrow Gordon M., Physical Chemistry, McGraw-Hill. **3.** Manahan Stanley E., Environmental Chemistry, CRC Press ***Latest editions of all the suggested books are recommended.**	

Additional electronics reference material:	1. https://www.youtube.com/watch?v=RV-OyRTaIOI 2. https://www.youtube.com/watch?v=phhfkikb6Lw	

Course Code: EAS263	B.Tech- Semester-II **Engineering Chemistry (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Hardness of water.	
CO2.	**Analyzing** & estimating of various parameters of water.	
CO3.	**Analyzing** of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter.	
CO4.	**Analyzing** of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus.	
CO5.	**Analyzing** of viscosity of lubricating oil using Redwood Viscometer.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	Determination of Total Hardness of a given water sample.	
2	Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate	
3	To determine the pH of the given solution using pH meter and pH-metric titration	
4	Determination of dissolved oxygen content of given water sample	
5	To find chemical oxygen demand of waste water sample by potassium dichromate	
6	Determination of free chlorine in a given water sample	
7	To determine the chloride content in the given water sample by Mohr's method	
8	To prepare the Bakelite resin polymer	
9	To determine the concentration of unknown sample of iron spectrophotometrically	
10	To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer	
11	To determine the flash & fire point of a given lubricating oil	
12	Determination of calorific value of a solid or liquid fuel.	
13	Determination of calorific value of a gaseous fuel	
14	Determination of % of O_2, CO_2, % CO in flue gas sample using Orsat apparatus.	
15	Proximate analysis of coal sample.	

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE217	B.Tech-Semester-I **Basic Electrical Engineering**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the basics of Network, AC Waveform and its characteristics.	
CO2.	**Understanding** the basic concept of Measuring Instruments, Transformers & three phase Power systems.	
CO3.	**Understanding** the basic concepts of Transformer.	
CO4.	**Understanding** the basic concept of power measurement using two wattmeter methods.	
CO5.	**Applying** the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits.	
Course Content:		
Unit-1:	**D.C. Network Theory:** Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorem, Star-delta & delta-star conversion.	**8 Hours**
Unit-2:	**Steady State Analysis of A.C. Circuits:** Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor.	**8 Hours**
Unit-3:	**Basics of Measuring Instruments:** Introduction to wattmeter & Energy meter extension range of voltmeter and ammeter. **Three Phase A.C. Circuits:** Line and phase voltage/current relations; three phase power, power measurement using two wattmeter methods.	**8 Hours**
Unit-4:	**Single phase Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses.	**8 Hours**
Unit-5:	**Electrical machines:** DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)	**8 Hours**
Text Books:	**1.** Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill	
Reference Books:	**1.** Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill. **2.** A Grabel, Basic Electrical Engineering, McGraw Hill. **3.** Cotton H., Advanced Electrical Technology, Wheeler Publishing. 4. Del Toro, Principles of Electrical Engineering, Prentice-Hall International. **5.** W.H. Hayt & J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://nptel.ac.in/courses/108/108/108108076/ 2. https://sites.google.com/tmu.ac.in/dr-garima-goswami/home	

Course Code: EEE261	B.Tech- Semester-II **Basic Electrical Engineering (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Kirchoff & Voltage law.	
CO2.	**Understanding** the concepts of dc network theorem.	
CO3.	**Analyzing** the energy by a single-phase energy meter.	
CO4.	**Analyzing** the losses and efficiency of Transformer on different load conditions.	
CO5.	**Analyzing** the electrical circuits using electrical and electronics components on bread board.	
LIST OF EXPERIMENTS:	**Note: Select any ten experiments from the following list**	
1	To verify the Kirchhoff's current and voltage laws.	
2	To study multimeter.	
3	To verify the Superposition theorem	
4	To verify the Thevenin's theorem.	
5	To verify the Norton's theorem.	
6	To verify the maximum power transfer theorem	
7	To verify current division and voltage division rule.	
8	To measure energy by a single-phase energy meter	
9	To measure the power factor in an RLC by varying the capacitance	
10	To determine resonance frequency, quality factor, bandwidth in series resonance	
11	To measure the power in a 3-phase system by two-wattmeter method	
12	To measure speed for speed control of D.C. Shunt Motor	
13	To determine the efficiency of single-phase transformer by load test.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC211	B.Tech- Semester-II **Basic Electronics Engineering**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of electronic components like diode, BJT & FET.	
CO2.	**Understanding** the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers	
CO3.	**Understanding** the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier.	
CO4.	**Understanding** the concepts of number system, Boolean algebra and logic gates.	
CO5.	**Applying** the knowledge of series, parallel and electromagnetic circuits.	
Course Content:		
Unit-1:	**p-n Junction:** Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator	**8 Hours**
Unit-2:	**Bipolar Junction Transistor (BJT):** Basic construction, transistor action; CB, CE and CC configurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias	**8 Hours**
Unit-3:	**Field Effect Transistor (FET):** Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self-biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics.	**8 Hours**
Unit-4:	**Operational Amplifier (Op-Amp):** Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator.	**8 Hours**
Unit-5:	**Switching Theory:** Number system, conversion of bases (decimal, binary, octal and hexa decimal numbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth table- AND, OR & NOT, Seven segment display & K map.	**8 Hours**
Text Books:	**1.** Robert Boylestad & Louis Nashelsky, Electronic Circuit and Devices, Pearson India.	
Reference Books:	**1.** Sedra and Smith, Microelectronic Circuits, Oxford University Press. **2.** Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd. **3.** Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	**1.** https://www.youtube.com/watch?v=USrY0JspDEg **2.** https://www.youtube.com/watch?v=Hkz27cFW4Xs	

Course Code: EEC261	B.Tech- Semester-II **Basic Electronics Engineering (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the implementation of diode-based circuits.	
CO2.	**Understanding** the implementation of Operational amplifier-based circuits.	
CO3.	**Analyzing** the characteristics of pn junction diode & BJT.	
CO4.	**Analyzing** the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs.	
CO5.	**Analyzing** the truth tables through the different type's adders.	
LIST OF EXPERIMENTS:	**Note: Minimum eight experiments should be performed-**	
1	To study the V-I characteristics of p-n junction diode.	
2	To study the diode as clipper and clamper	
3	To study the half-wave rectifier using silicon diode.	
4	To study the full-wave rectifier using silicon diode.	
5	To study the Zener diode as a shunt regulator.	
6	To study transistor in Common Base configuration & plot its input/output characteristics	
7	To study the operational amplifier in inverting & non-inverting modes using IC 741.	
8	To study the operational amplifier as differentiator & integrator.	
9	To study various logic gates & verify their truth tables.	
10	To study half adder/full adder & verify their truth tables	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: ECS212	B.Tech Semester-II **Computer System & Programming in C++**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of various components of computer system	
CO2.	**Understanding** the Object-Oriented Programming Language concepts.	
CO3.	**Analyzing** basic mathematical problem and their solutions through programming	
CO4.	**Applying** the concepts of programming solutions for distinct problems	
CO5.	**Applying** the concepts of scalable solutions through function	
Course Content:		
Unit-1:	**Problem Solving**: Phases of problem solving, Algorithms, Structure Chart, Flow chart, Practice of solving Sequence Problems, Selection Problems, Repetition problem. **Statements for problem solving:** if, switch, while, for, do, break, continue, go to statements.	**8 Hours**
Unit-2:	**Concepts in Computer Application:** Generations, Characteristic and Application of Computers, Functional Component of Computer: CPU, I/O devices, Type of Memory. Translators: Assembler, Compiler, and Interpreter; Number System: Decimal, Octal, Binary and Hexadecimal &their Conversions; Various Codes: BCD, ASCII and EBCDIC and Gray Code.	**8 Hours**
Unit-3:	**Concepts in Operating System**: Purpose, Services, Types, Functions. **Data Communication & Networks:** Types, Topology, IP address classes. C++ Basics: Data types, Variables, Constants, Keywords, Identifiers, Types of Operators, Memory Allocation operators, Expressions, Pre-processor directives, Introduction to Array, Pointers, Structures and Strings.	**8 Hours**
Unit-4:	**Functions:** Scope of variables; Parameter passing; Default arguments; Inline functions; Recursive functions; Pointers to functions. **C++ Classes and Data Abstraction: Class** Structure, Objects; this pointer; Friend function; Static class members; Constructors and Destructors; Data abstraction. **Inheritance:** Types, Access to the base class members; Virtual base class.	**8 Hours**
Unit-5:	**Polymorphism:** Function overloading; Operator overloading; Static Binding and Dynamic bindings; Virtual function: Definition, Call mechanism, Pure virtual functions; Virtual destructors; Abstract Classes. **C++ I/O:** Stream classes hierarchy; Stream I/O; File streams; Overloading << and >> operators; File Modes, Reading and Writing to a file; Formatted I/O.	**8 Hours**
Text Books:	1. Bjarne Stroutrup, The C++ Programming Languge, Adison Wesley.	
Reference Books:	1. Beginning C++, The Complete Language, Horton,SPD/WROX 2. Programming with C++, Radhaganesan, Scitech 3. Projects using C++, Varalaxmi, Scitech 4. Object Oriented modelling & Design, RumBaugh, PHI ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material:	1. https://www.youtube.com/watch?v=LZFoktwiars&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2 2. https://www.youtube.com/watch?v=XTiIiI-LOY8&list=PLJvIzs_rP6R73WlvumJvCQJrOY3U5zq1j	

Course Code: ECS262	B.Tech - Semester-II **Computer System & Programming in C++ (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of execution to programs written in C language.	
CO2.	**Applying** to prepare programming solutions for specific problems.	
CO3.	**Applying** to prepare scalable solutions through functions.	
CO4.	**Applying** basic elements of a C program including arithmetic and logical operators, functions, control structures, and arrays	
CO5.	**Analyzing** basic mathematical problem and their solutions through programming.	
LIST OF EXPERIMENTS:	**Note: Minimum 15 experiments should be performed from the following:**	
1	Write a Program (WAP) to calculate Sum & average of N numbers.	
2	WAP to convert integer arithmetic to a given number of day and month.	
3	WAP to find maximum and minimum out of 3 numbers a, b & c.	
4	WAP to find factorial of positive integer.	
5	WAP to find sum of series up to n number, 2+5+8+……+n.	
6	WAP to print all the number between 1 to 100 which are dividing by 7.	
7	WAP to generate Fibonacci series up to n.	
8	WAP to calculate area of circle using Functions.	
9	WAP to calculate factorial of given number using Recursion function.	
10	WAP to find whether number is prime or not.	
11	WAP to find that the enter character is a letter or digit.	
12	WAP to find addition of two matrix of n*n order.	
13	WAP to find multiplication of two matrix of n*n order.	
14	WAP to find even or odd up to a given limit n.	
15	WAP to find whether a given no is palindrome or not.	
16	WAP to Swap two numbers using third Variable and without using third variable.	
17	WAP to Swap two numbers using call by value and call by reference.	
18	WAP illustrating overloading of various operators.	
19	WAP illustrating use of Friend	
20	WAP illustrating use of Inline Function.	
21	WAP illustrating use of destructor and various types of constructor.	
22	WAP illustrating various forms of Inheritance.	
23	WAP illustrating use of virtual functions, virtual Base Class.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: TMUGE201	B.Tech - Semester-II **English Communication – II**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering & understanding** the basics of English Grammar and Vocabulary.	
CO2.	**Understanding** the basics of Listening, Speaking & Writing Skills.	
CO3.	**Understanding** principles of letter drafting and various types of formats.	
CO4.	**Applying** correct vocabulary and grammar in sentence construction while writing and delivering presentations.	
CO5.	**Analyzing** different types of listening, role of Audience & Locale in presentation.	
CO6.	**Drafting** Official Letters, E-Mail & Paragraphs in correct format.	
Course Content:		
Unit-1:	**Functional Grammar** • Prefix, suffix and One words substitution • Modals • Concord	**10 Hours**
Unit-2:	**Listening Skills** • Difference between listening & hearing, Process and Types of Listening • Importance and Barriers to listening	**04 Hours**
Unit-3:	**Writing Skills** • Official letter and email writing • Essentials of a paragraph, • Developing a paragraph: Structure and methods Paragraph writing (100-120 words)	**12 Hours**
Unit-4:	**Strategies & Structure of Oral Presentation** • Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body langauge • Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch. • Modes of speech delivery and 5 W's of presentation	**8 Hours**
Unit-5:	**Value based text reading:** Short Essay (Non- detailed study) How should one Read a book? - Virginia Woolf	**6 Hours**
Text Books:	**1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	**1.** Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers **2.** Sood Madan "*The Business letters"* Goodwill Publishing House, New Delhi **3.** Kumar Sanjay & Pushplata "*Communication Skills"* Oxford University Press, New Delhi. ***Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	**1.** https://www.youtube.com/watch?v=A0uekze2GOU **2.** https://www.youtube.com/watch?v=JIKU_WT0Bls **3.** https://www.youtube.com/watch?v=3Tu1jN65slw **4.** https://youtu.be/sb6ZZ2p3hEM	

	5. https://youtu.be/yY6-cgShhac **6.** https://youtu.be/cc4yXwOQsBk **7.** https://youtu.be/yY6-cgShhac **8.** https://youtu.be/84qoeCofXXQ **9.** https://www.youtube.com/watch?v=-9MXmxLisI8&t=28s	
Methodologies :	**1.** Words and exercises, usage in sentences. **2.** Language Lab software. **3.** Sentence construction on daily activities and conversations. **4.** Format and layout to be taught with the help of samples and preparing letters on different subjects. **5.** JAM sessions and Picture presentation. **6.** Tongue twisters, Newspaper reading and short movies. **7.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized. **8.** Text reading: discussion in detail, critical appreciation by reading the text to develop students' reading habits with voice modulation.	

Evaluation Scheme

<table>
<tr><th colspan="3">Internal Evaluation</th><th colspan="2">External Evaluation</th><th>Total Marks</th></tr>
<tr><td colspan="3">40 Marks</td><td colspan="2">60 Marks</td><td rowspan="4">100</td></tr>
<tr><td>20 Marks (Best 2 out of Three</td><td>10 Marks (Oral</td><td rowspan="3">10 Marks (Attendance)</td><td>40 Marks (External Written</td><td>20 Marks</td></tr>
<tr><td>CTs)</td><td>Assignments)</td><td>Examination)</td><td>(External Viva)*</td></tr>
<tr><td>(From Unit-I, III & V)</td><td>(From Unit-II &IV)</td><td>(From Unit-1, III & V)</td><td>(From Unit- II & IV)</td></tr>
</table>

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**: External Viva will be conducted by 2-member committee comprising*

***a)** One Faculty teaching the class*

***b)** One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: EME261	B.Tech- Semester-II **Engineering Drawing (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts of Engineering Drawing.	
CO2.	**Understanding** how to draw and represent the shape, size & specifications of physical objects.	
CO3.	**Applying** the principles of projection and sectioning.	
CO4.	**Applying** the concepts of development of the lateral surface of a given object.	
CO5.	**Creating** isometric projection of the given orthographic projection.	
LIST OF EXPERIMENTS:	**All to be performed**	
1	To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions.	
2	To draw the types of lines and conventions of different materials.	
3	To draw and study dimensioning and Tolerance	
4	To construction geometrical figures of Pentagon and Hexagon	
5	To draw the projection of points and lines	
6	To draw the Orthographic Projection of given object in First Angle	
7	To draw the Orthographic Projection of given object in Third Angle	
8	To draw the sectional view of a given object	
9	To draw the development of the lateral surface of given object	
10	To draw the isometric projection of the given orthographic projection.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Drawing Sheet (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Note: The drawing sheet could be manual or in Auto CAD.

Course Code: EME262	B.Tech- Semester-II **Workshop Practice (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts to prepare simple wooden joints using wood working tools.	
CO2.	**Applying** the techniques to produce fitting jobs of specified dimensions.	
CO3.	**Applying** the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment.	
CO4.	**Applying** the concepts of black smithy and lathe machine to produce different jobs.	
CO5.	**Creating** core and moulds for casting.	
LIST OF EXPERIMENTS:	**Perform any ten experiments selecting at least one from each shop**	
1	**Carpentry Shop**: 1. To prepare half-lap corner joint. 2. To prepare mortise &tenon joint. 3. To prepare a cylindrical pattern on woodworking lathe.	
2	**Fitting Bench Working Shop:** 1. To prepare a V-joint fitting 2. To prepare a U-joint fitting 3. To prepare a internal thread in a plate with the help of tapping process	
3	**Black Smithy Shop:** 1. To prepare a square rod from given circular rod 2. To prepare a square U- shape from given circular rod	
4	**Welding Shop:** 1. To prepare a butt and Lap welded joints using arc welding machine. 2. To prepare a Lap welded joint Gas welding equipment. 3. To prepare a Lap welded joint using spot welding machine	
5	**Sheet-metal Shop:** 1. To make round duct of GI sheet using 'soldering' process. 2. To prepare a tray of GI by fabrication	
6	**Machine Shop:** 1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c. 2. To perform the following operations on Centre Lathe: Turning, Step turning, Taper turning, Facing, Grooving and Knurling 3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine.	
7	**Foundry Shop:** 1. To prepare core as per given size. 2. To prepare a mould for given casting.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EGP211	B.Tech- Semester-II **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: EEE311	B. Tech (Electrical)- Semester-III **Electrical Mechanics-I**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the fundamental principles and classification of electromagnetic machines.	
CO2.	**Understanding** the working of dc machines as generators and motors.	
CO3.	**Understanding** the constructional details, principle of operation, testing and applications of transformers.	
CO4.	**Analyzing** the testing and applications of dc machines.	
CO5.	**Analyzing** the constructional details and principle of operation of dc machines.	
Course Content:		
Unit-1:	**Principles of Electromechanical Energy Conversion:** Flow of Energy in Electromechanical Devices; Energy in Magnetic Systems; Singly Excited Systems, Determination of Mechanical Force, Mechanical Energy, Torque Equation; Doubly Excited Systems, Energy Stored in Magnetic Field, Electromagnetic Torque; Generated EMF in Machines; Torque in Machines with Cylindrical Air Gap.	**8 Hours**
Unit-2:	**D.C. Machines:** Construction of DC Machines, Armature winding; Emf and Torque equation; Armature reaction; Commutation, Interpoles and Compensating windings; Performance characteristics of D.C. generators.	**8 Hours**
Unit-3:	**D.C. Machines (Contd.):** Performance characteristics of D.C. motors; Starting of D.C. motors, Concept of starting (3 point and 4 point starters); Speed control of D.C. motors, Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test).	**8 Hours**
Unit-4:	**Transformer:** Three-phase transformer Construction; Three-phase unit transformer and Bank of three single-phase transformers with their advantages; Three-phase transformer Groups (Phasor groups) and their connections; Y-Connection, Open delta connection, Three-phase/ 2 phase Scott connection and its application.	**8 Hours**
Unit-5:	**Transformer (Contd.):** Sumpner's test; All day efficiency; Polarity test; Excitation Phenomenon in Transformers, Harmonics in single-phase and 3-phase transformers; Parallel operation and load sharing of single-phase and three-phase transformers; Three-winding transformers, Tertiary winding.	**8 Hours**
Text Book:	**1.** I. J Nagrath. & D.P. Kothari, Electrical Machines, Tata McGraw Hill.	
Reference Books:	1. A.E Fitggerald. C. Kingsley Jr & Alexander Kusko, Electric Machinery, McGraw Hill. 2. A.E Clayton, the Performance and Design of DC Machines, Pitman & Sons. 3. M.G. Say, "The Performance and Design of AC Machines". Pit man& Sons. 4. A.S Langsdorf, "Theory of Alternating Current Machinery", Tata McGraw Hill. 5. Ashfaq Husain, Electrical Machines, Dhanpat Rai & Sons. *** Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	1. https://nptel.ac.in/courses/108/102/108102146/ **2.** www.tjprc.org	

Course Code: EEE361	B. Tech (Electrical)- Semester-III Electrical Mechanics-I (Lab)	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** the concepts of Load testing on DC Shunt machine and observe the finding.	
CO2.	**Applying** the concept of no load and full load to find the losses in transformer.	
CO3.	**Analyzing** the performance indices of machines using standard analytical as well as graphical methods by performing various tests.	
CO4.	**Analyzing** DC machines performance by performing various tests on them.	
CO5.	**Analysing** the transformer and obtaining performance indices using standard analytical as well as graphical methods.	
EXPERIMENTS:	**Note: Minimum ten experiments should be performed.**	
Experiment-1:	To obtain load characteristics of a dc shunt generator.	
Experiment-2:	To obtain load characteristics of a dc series generator.	
Experiment-3:	To obtain load characteristics of a dc compound generator- **(a)** Cumulatively compounded. **(b)** Differentially compounded.	
Experiment-4:	To obtain speed – torque characteristics of a dc shunt motor.	
Experiment-5:	To obtain speed – torque characteristics of a dc shunt motor.	
Experiment-6:	To determine the efficiency of the DC machines by Hopkinson test.	
Experiment-7:	To plot the characteristics of a DC shunt motor using armature & field control methods	
Experiment-8:	To determine the efficiency and losses by O.C. and S.C. tests on a single phase transformer.	
Experiment-9:	To determine the efficiency & voltage regulation of a single-phase transformer using Sumpner's (back to back) test.	
Experiment-10:	To perform the open circuit (O.C.) and short circuit (S.C.) tests on a single-phase transformer.	
Experiment-11:	To perform the open circuit (O.C.) and short circuit (S.C.) tests on a three-phase transformer.	
Experiment-12:	To obtain 3-phase to 2-phase conversion by Scott connection.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE312	B. Tech (Electrical)- Semester-III **Circuit Theory**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of linear systems and to apply Kirchhoff's laws in Circuit problems.	
CO2.	**Understanding** the concepts of power measurements in 3- phase circuits.	
CO3.	**Understanding** the concept of Self and mutual inductance in Circuits.	
CO4.	**Applying** the concept of network theorems to solve DC and AC circuit problems.	
CO5.	**Evaluating** and model first and second order electric systems involving capacitors and inductors	
Course Content:		
Unit-1:	Basics of Circuits: Ideal sources, Dependent and Independent sources; Linear relation between voltage and current of Network elements; Source Transformation; Types of Networks, Network reduction; Voltage division, Current division; Star – delta transformation; Concept of duality, Dual networks.	**8 Hours**
Unit-2:	Coupled Circuits: Self Inductance, Mutual Inductance, Coefficient of coupling; Dot rule; Ideal transformer; Effective inductance of coupled coils in series & parallel, Analysis of coupled circuits.	**8 Hours**
Unit-3:	Single -Phase Circuits: Inductors and capacitors in series & parallel combination; Voltage, current and power relations in RL, RC, and RLC circuits; Nodal and mesh analysis in AC circuits.	**8 Hours**
Unit-4:	Three- Phase Circuits: Three phase circuits, Balanced circuits, Star and delta connected loads; phase sequence; unbalanced circuits, solution of unbalanced star and delta connected loads; Power measurement by two wattmeter methods.	**8 Hours**
Unit-5:	Transient Analysis: Source free and forced response of RL, RC & RLC circuits; Time constant and natural frequency of oscillations; Applications of Laplace transformation to RL, RC & RLC circuits.	**8 Hours**
Text Book:	1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.	
Reference Books:	1. S D Senturia, B.D Wedlock, "Electronic Circuits and Applications", Wiley. 2. J W Nilsson, S A Riedel, "Electric Circuits", Prentice Hall. 3. W H Hayt, J E Kemmerly, Engineering Circuit Analysis, McGraw Hill. 4. R C Dorf, J Svoboda, An Introduction to Electric Circuits, Wiley. *** Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	1. https://nptel.ac.in/courses/108/102/108102042/ 2. http://ijece.iaescore.com/index.php/IJECE	

Course Code: EEC311	**B.Tech (Electrical)- Semester-III** **Engineering Electromagnetics**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** EM wave propagation in free space and in dielectric medium.	
CO2.	**Understanding** the power flow mechanism in guiding structures and in unbounded medium.	
CO3.	**Analyzing** electromagnetic wave propagation in guiding structures under various matching conditions.	
CO4.	**Analyzing** power transmission lines in Electromagnetic Field Theory.	
CO5.	**Evaluating** Maxwell's equations using vector calculus in three standard coordinate systems.	
Course Content:		
Unit-1:	**Coordinate systems and transformation:** Cartesian coordinates, Cylindrical coordinates, Spherical coordinates; Vector calculus: Differential length, area and volume; Line, surface and volume integrals; Del operator; Gradient of a scalar; Divergence; Curl, Stokes' theorem, green's theorem.	**8 Hours**
Unit-2:	**Electrostatics:** Electrostatic fields; Coulomb's law and field intensity; Electric field due to charge distribution; Electric flux density; Gauss' Law; Electric dipole and flux lines; energy density in electrostatic fields. **Electric field in material space:** Properties of materials; Convection and conduction currents; Conductors; Polarization in dielectrics; Dielectric constants; Continuity equation and relaxation time; Boundary conditions.	**10 Hours**
Unit-3:	**Plane Waves:** Maxwell's equations; Wave equation in an isotropic homogeneous medium and its solution, Phasor notation, Polarization of waves, Reflection and refraction of plane waves at plane Boundaries, Pointing vector.	**8 Hours**
Unit-4:	**Waveguides:** Electromagnetic fields: Parallel-plate, Rectangular and circular waveguides; TE and TM modes; Wave impedance; Wave velocities; Attenuation in waveguides.	**6 Hours**
Unit-5:	**Planar Transmission Line:** Electromagnetic fields: Strip-lines, Micro-strip-lines, Co-planar Waveguides, Transmission line parameters; Transmission line equations; Input impedance; Standing wave ratio and power; **Cavity Resonators:** Rectangular and cylindrical resonators.	**8 Hours**
Text Books:	**1.** Kraus, J.D. and Fleisch, D.A., Electromagnetics with Applications, McGraw Hill.	
Reference Books:	1. Kaduskar, Principles of Electromagnetics, Wiley India 2. Ida, N., Engineering Electromagnetics, Springer 3. Kodali, Engineering Electromagnetic Compatibility, John Wiley & sons. 4. E.C. Jordan, K.G. Balmain, E. M. Waves & Radiating Systems, Pearson Education 5. William H. Hayt, John A. Buck, Engineering Electromagnetics, McGraw-Hill Publishing Co. 6. Matthew N.O. Sadiku, Principles of Electromagnetics, Oxford University Press. *** Latest editions of all the suggested books are recommended.**	

Additional Electronic Reference Material:	1. https://nptel.ac.in/courses/108/104/108104087/ 2. https://www.youtube.com/watch?v=yRdifN00Vuc	

Course Code: EEC312	B.Tech (Electrical)- Semester-III **Digital Logic & Circuits**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** the various number systems and its application in digital design.	
CO2.	**Understanding** of the fundamental concepts and techniques used in digital electronics.	
CO3.	**Applying** the concepts of digital logic in various digital circuits including counter, timers, etc.	
CO4.	**Analyzing** the design process of the various combinational and sequential circuits.	
CO5.	**Evaluating** the basic requirements for a design application and propose a cost-effective solution	
Course Content:		
Unit-1:	Codes: BCD codes, 8421 code, Excess-3 code, Gray code, error detection and correction, Hamming code.	**6 Hours**
Unit-2:	SR, JK, D, T flip-flops & latches, Master-Slave flip-flop.Flip-flop excitation table, Classification of sequential circuits, Registers, Counters, Sequence Detector and Sequence Generator, state diagram and state reduction assignment.	**10 Hours**
Unit-3:	RTL, DTL, TTL, IIL and ECL working and their characteristics, Propagation delay, Fan-In, Fan-Out, Noise Margin.	**6 Hours**
Unit-4:	Binary adder and subtractor, Multiplexers, Decoders, Demultiplexers, Implementation of Combinatorial Logic using these devices.	**6 Hours**
Unit-5:	Semiconductor Memories, RAM, SRAM, DRAM, ROM, PROM, EPROM and EEPROM. Memory System design, Charged-Coupled device memory, PLA, PAL.	**8 Hours**
Textbooks:	1. M. Morris Mano, Digital Design, Prentice Hall of India.	
Reference Books:	**1.** Malvino and Leach, Digital principle and applications, McGraw Hill **2.** Cheung, Modern digital systems design (WPC) **3.** Thomas Downs and Mark F Schulz, Logic Design with Pascal, Van Nostrand Reinhold. **4.** Godse A.P, Switching Theory Technical Publication. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/117/106/117106086/ https://www.youtube.com/playlist?list=PLDp9Jik5WjRs-2PL7nN2xTWINWBySuSot	

Course Code: EEC361	B.Tech (Electrical) - Semester-III **Digital Logic & Circuits (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the basics of gates.	
CO2.	**Applying** the design procedures to design basic sequential circuits.	
CO3.	**Analyzing** the basic combinational circuits and verifying their functionalities.	
CO4.	**Creating** the circuits of the counters and shift registers.	
CO5.	**Creating** the basic digital circuits and verifying their operation.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiments-1:	To verify truth tables of various Gates AND, OR, NOT, NAND, NOR, Ex-OR and Ex-NOR.	
Experiment-2:	To verify truth table of half adder and full adder.	
Experiments-3:	To verify truth table of half subtractor and full subtractor.	
Experiments-4:	To study Multiplexer, Demultimplexer.	
Experiments-5:	To study encoder, decoder.	
Experiments-6:	To study flip flops.	
Experiments-7:	To study magnitude comparator.	
Experiments-8:	To study registers, counters.	
Experiments-9:	To study BCD to binary converter.	
Experiments-10:	To study & test the digital IC by automatic digital IC trainer.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC315	B.Tech (Electrical)- Semester-III **Signals & Systems**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** the process of system implementation and characterization.	
CO2.	**Understanding** the knowledge of test signals, inner product, norm and orthogonal basis to signals.	
CO3.	**Applying** the spectral characteristics of continuous-time periodic and a periodic signals using time invariant analysis.	
CO4.	**Analyzing** the systems based on their properties and determine the response of LTI system using Laplace transform.	
CO5.	**Evaluating** the system properties based on impulse response and Fourier transforms.	
CO6.	**Creating** & solving the real time problems based on Laplace transform and Z- transform for continuous-time and discrete-time signals and systems.	
Course Content:		
Unit-1:	**Signals**: Definition, Continuous time signals, Periodic and non-periodic, Even and odd, Energy and power, Deterministic and random, continuous time signals & discrete time signals, one-dimensional & multi-dimensional; Unit impulse, Unit step, Unit ramp, Rectangular, Exponential, Sinusoidal; Operations on continuous time signals.	**8 Hours**
Unit-2:	Continuous time systems**,** causal and non-causal, linear and non-linear; Time-invariance, static and dynamic systems, Impulse response and properties, Characterization of Linear-Time invariant (LTI) systems, Step response of discrete time systems; BIBO Stability, Convolution integral, Co-relations.	**8 Hours**
Unit-3:	**Laplace-Transform (LT)**: One-sided LT and Bilateral LT of some common signals, properties and important theorems of LT, Regions of convergence (ROC) and its properties, Inverse LT.	**8 Hours**
Unit-4:	**Continuous Time Fourier Transforms (CTFT)**: Definition, Conditions of existence of CTFT, Properties, Magnitude and phase spectra, Some important CTFT theorems, Parseval's theorem, Inverse FT, Relation between LT and FT.	**8 Hours**
Unit-5:	**Z-Transform:** One sided and two-sided Z-transforms, properties and theorems, Parseval's theorem, ROC and its properties, Z-transform of some common signals.	**8 Hours**
Text Books:	**1.** P. Ramakrishna Rao, "Signal and Systems", Tata McGraw Hill, New Delhi.	
Reference Books:	**1.** Chi-Tsong Chen, `Signals and Systems', 3rd Edition, Oxford University Press. **2.** V. Oppenheim, A.S. Willsky and S. Hamid Nawab, "Signals & Systems", Pearson Education. *** Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/117/104/117104074/ https://www.youtube.com/watch?v=x5qRAihZRks	

Course Code: TMUGE301	B. Tech (Electrical)- Semester-III **English Communication- III**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** knowledge of grammar to face competitive exams.	
CO2.	**Understanding** advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context.	
CO3.	**Understanding** listening for effective communication.	
CO4.	**Applying** their English grammar knowledge in day to day context.	
CO5.	**Applying** writing and comprehensive skills in English.	
CO6.	**Analyzing** Comprehending & enriching their vocabulary through prescribed text.	
Course Content:		
Unit-1:	**English Grammar & Vocabulary** • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Synthesis: Simple, complex and compound sentence • Commonly used Idioms & phrases (Progressive learning whole semester)	**14 Hours**
Unit-2:	**Speaking Skills** • Art of public speaking • Common conversation • Extempore • Power Point Presentation (PPt) Skills: Nuances of presenting PPTs	**10 Hours**
Unit-3:	**Comprehension Skills** • Strategies of Reading comprehension: Four S's • How to solve a Comprehension (Short unseen passage: 150-200 words)	**6 Hours**
Unit-4:	**Professional Writing** • Preparing Notice, Agenda & Minutes of the Meeting	**7 Hours**
Unit-5:	**Value based text reading:** Short story • The Barber's Trade Union - Mulk Raj Anand	**3 Hours**
Text Books:	**1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	**1.** Wren & Martin *"High School English Grammar and Composition*" S.Chand & Co.Ltd., New Delhi. **2.** Kumar Sanjay &Pushplata *"Communication Skills*" Oxford University Press, New Delhi. **3.** Agrawal, Malti *"Professional Communication*" Krishana Prakashan Media (P) Ltd. Meerut. ***Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	1- https://www.youtube.com/watch?v=dpYltVtsS_Q 2- https://www.youtube.com/watch?v=Z8HttKW8jVE 3- https://www.youtube.com/watch?v=srn5jgr9TZo 4- https://www.youtube.com/watch?v=En9-8xWYWqk 5- https://www.youtube.com/watch?v=aUEpmAo0OvM	
Methodology:	**1.** Idiom & Phrases and exercises, usage in sentences. **2.** Language Lab software. **3.** Power Point presentation. **4.** Newspaper reading, short articles from newspaper to comprehend and short movies.	

	5. Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized. **6.** Text reading: discussion in detail, Critical appreciation by reading the text to develop students' reading habits with voice modulation.	

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			60 Marks		
20 Marks (Best 2 out of Three CTs) (From Unit-I, III, IV & V)	10 Marks (Oral Assignments) (Unit -II)	10 Marks (Attendance)	40 Marks (External Written Examination) (From Unit-1, III, IV & V)	20 Marks (External Viva)* (Unit -II)	100

*Parameters of External Viva

Content	Body Language	Communication skills	Confidence	TOTAL
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

Note: External Viva will be conducted by 2-member committee comprising

a) One Faculty teaching the class

b) One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: EGP311	B.Tech- Semester-III **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: TMUGA-301	Value Added Course B.Tech.- Semester-III **Foundation in Quantitative Aptitude**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Solving complex problems using Criss cross method, base method and square techniques.	
CO2.	Applying the arithmetical concepts of Average, Mixture and Allegation.	
CO3.	Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction.	
CO4.	Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation.	
Course Content:		
Unit-1:	**Speed calculations** Squares till 1000,square root, multiplications: base 100, 200 300 etc., 11-19, crisscross method for 2X2, 3X3, 4X4, 2X3, 2X4 etc., cubes, cube root	**3 Hours**
Unit-2:	**Percentages** Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems	**5 Hours**
Unit-3:	**Profit Loss Discount** Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights	**5 Hours**
Unit-4:	**SI and CI** Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments	**4 Hours**
Unit-5:	**Averages** Basic Averages, Concept of Distribution, Weighted Average, equations	**3 Hours**
Unit-6:	**Mixtures and allegations** Mixtures of 2 components, mixtures of 3 components, Replacements	**5 Hours**
Unit-7:	**Blood relations** Indicating type, operator type, family tree type	**3 Hours**
Unit-8:	**Direction sense** Simple statements, shadow type	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: EEE411	B. Tech (Electrical)- Semester-IV **Electrical Machines-II**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the working of synchronous machines as generators and motors.	
CO2.	**Understanding** the testing and applications of synchronous machines.	
CO3.	**Understanding** the construction features and method of operation of stepper motor and designing the drive amplifier and transistor logic for stepper motor.	
CO4.	**Understanding** the basic principles and classification of servo motors.	
CO5.	**Analysing** the process of testing and applications of induction motors.	
Course Content:		
Unit-1:	**Three-Phase Induction Motor:** Principle of operation; Slip; Equivalent circuit; Torque equations, Slip-torque characteristics; Constructional details, Types of rotors; Losses and efficiency; Load test: No load and blocked rotor tests; Circle diagram; Separation of no load losses; Crawling and Cogging; Double cage rotors; Induction generator.	8 Hours
Unit-2:	**Starting and speed control of Three-Phase Induction Motor:** Need for starting, Types of starters: Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters; Speed control by changes of voltage, Frequency, Poles and rotor resistance, Cascaded connection.	8 Hours
Unit-3:	**Alternator:** Constructional details, Types of rotors; EMF equation; Synchronous reactance; Armature reaction; Voltage regulation: EMF, MMF and Zero Power Factor methods; Synchronizing and parallel operation, synchronizing power, Change of excitation and mechanical input; Blondel's theory, Determination of Xd and Xq using slip test.	8 Hours
Unit-4:	**Synchronous Motor:** Principle of operation; Torque equation; Starting methods; Operation on infinite bus bars, V and inverted V curves; Power input and power developed equations, Power/power angle relations; Hunting; Synchronous condenser; Applications	8 Hours
Unit-5:	**Special Machines:** introduction to Stepper motor, servo motor, BLDC motor and electric vehicle motors with their applications. **Single Phase Induction Motor:** Double revolving Field Theory, Equivalent circuit, No load & Blocked Rotor Test, Starting Methods.	8 Hours
Text Books:	1. D.P. Kothari and I. J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd.	
Reference Books:	1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill Publishing Company Ltd. 2. Dr. P.S. Bhimbra, "AC machines", Khanna Publishers. 3. Ashfaq Husain, "Electric Machines", Dhanpat Rai. 4. K. Murugesh Kumar, 'Induction & Synchronous Machines', Vikas Publishing House Pvt. Ltd. *** Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	https://nptel.ac.in/courses/108/105/108105017/ https://journal.esrgroups.org/jes/	
Course Code: EEE461	B. Tech (Electrical)- Semester-IV	L-0 T-0

	Electrical Machines-II (Lab)	P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** the concepts of Load testing on Induction motor and observe the output	
CO2.	**Analyzing** AC machines performance by performing various tests on them.	
CO3.	**Analyzing** the performance indices of machines using standard analytical as well as graphical methods by performing various tests.	
CO4.	**Analyzing** the starting methods of AC machines.	
CO5.	**Analyzing** the Voltage regulation of alternator at different slip.	
Experiments:	**Note: Minimum ten experiments should be performed.**	
Experiment-1:	To determine the voltage regulation of three-phase alternator by EMF, MMF and ZPF methods.	
Experiment-2:	To perform the load test on three-phase alternator.	
Experiment-3:	To determine voltage regulation of three-phase salient pole alternator by slip test.	
Experiment-4:	To plot 'V' and Inverted' V' curves of Three Phase Synchronous Motor.	
Experiment-5:	To perform the load test on three-phase squirrel cage induction motor.	
Experiment-6:	To perform the load test on three-phase slip ring induction motor.	
Experiment-7:	To perform No load and blocked rotor test on three-phase induction motor.	
Experiment-8:	To perform No load and blocked rotor test on single-phase induction motor	
Experiment-9:	To measure the efficiency of the three-phase induction motor using loss summation method.	
Experiment-10:	To perform load test on single-phase induction motor.	
Experiment-11:	To plot characteristics of three phase induction motor by V/f method	
Experiment-12:	To determine the parameters of single phase induction motor using open circuit and short circuit test.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code:		**L-3**

EEE412	B. Tech (Electrical)- Semester-IV **Electrical Measurements and Measuring Instruments**	T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** different types of meters their work and their construction.	
CO2.	**Understanding** the working of various instruments and equipment used for the measurement of various electrical engineering parameters like voltage, current, power etc. Understanding about instrument transformers.	
CO3.	**Applying** the innovative ideas to improve the existing technology in the field of measurements in terms of accuracy, cost, durability and user friendliness.	
CO4.	**Analysing** the methods of solving the varieties of problems and issues coming up in the vast field of electrical measurements.	
CO5.	**Analysing** and controlling any physical system.	
Course Content:		
Unit-1:	**Philosophy of Measurement:** Methods of Measurement, Measurement Systems; classification of Instruments; Characteristic of Instruments & Measurement systems; Errors in Measurement.	**8 Hours**
Unit-2:	**Analog Measurement of Electrical Quantities:** Galvanometer& its types, Electrodynamic type Ammeters, Voltmeters & Wattmeter, Three Phase Wattmeter, Power in three Phase System, Errors in Wattmeter. **Potential Transformer (PT) & Current Transformer (CT):** Phase Angle and Ratio errors; Construction and design considerations; Applications.	**8 Hours**
Unit-3:	**Measurement of Resistance, Capacitance and Inductance:** Measurement of resistances, Inductance & Capacitance ; Q Factor Measurement. **AC Potentiometer:** Polar type & Co-ordinate type AC potentiometers; Applications of AC Potentiometers in Electrical Measurement.	**8 Hours**
Unit-4:	**Cathode Ray Oscilloscope**: Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) &its principal of operation, its component, Application of CRO and Lissajous Patterns in measurement. **Digital Instruments and Measurements:** Concept of Digital Measurement, Block Diagram: Digital Voltmeter, Frequency meter, multi-meter and their applications.	**8 Hours**
Unit-5:	**Transducers**: Classification and selection of transducers; Measurement of mechanical variables: Displacement, Force, Strain, and Measurement of temperature, pressure, flow and level. **Display Devices and recorders**: Display devices: LED, LCD, & 7 Segment Display, Analogue recorders: Strip chart, u-v light and x-y Recorders, their tracings and marking mechanisms.	**8 Hours**
Text Book:	**1.** A.K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India.	
Reference Books:	**1.** Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India. **2**. W. D. Cooper, "Electronic Instrument & Measurement Technique", prentice hall International. **3.** Rajendra Prashad, "Electrical Measurement &Measuring Instrument", Khanna Publisher.	

	4. E.W. Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", A.W. Wheeler & Co. Pvt. Ltd. India. *** Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	• https://nptel.ac.in/courses/108/105/108105153/ • https://www.iaras.org/iaras/journals/ijim	

Course Code: EEE462	B. Tech (Electrical)- Semester-IV **Electrical Measurements and Measuring Instruments (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** the principles of Electrical Measurements and Instrumentation Engineering through laboratory experimental work.	
CO2.	**Applying** the various methods to measure unknown résistance, inductance & capacitance.	
CO3.	**Analysing** calibrated meter readings with standard meters.	
CO4.	**Analysing** transient response of electrical circuits on CRO	
CO5.	**Creating** the circuit to perform experiments, measure, analyse the observed data to come to a conclusion.	
Experiments:	**Note: Minimum ten experiments should be performed.**	
Experiment-1:	To calibrate the ammeter and voltmeter.	
Experiment-2:	To measure the self-inductance by Maxwell's Bridge.	
Experiment-3:	To measure the self-inductance by Hay's Bridge.	
Experiment-4:	To measure the self-inductance by Anderson's Bridge.	
Experiment-5:	To measure the self-inductance by Owen's Bridge.	
Experiment-6:	To measure the self-capacitance by Schering Bridge.	
Experiment-7:	To measure the self-capacitance by De-Sauty's Bridge.	
Experiment-8:	To measure the low resistance by Kelvin's Double Bridge.	
Experiment-9:	To trace out the transient response of RLC series circuits using storage type CRO.	
Experiment-10:	To trace out the transient response of RLC parallel circuits using storage type CRO	
Experiment-11:	To Measure the frequency of sine, triangular, square wave signal generated by a function generator and verify its frequency at 100 Hz tap point using "labview" software.	
Experiment-12:	To Measure the voltage and current level of the signal generated by programmable power supply.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE413	B. Tech (Electrical)- Semester-IV **Network Analysis & Synthesis**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the circuit matrices of linear graphs and analyzing basic electrical networks using graph theory.	
CO2.	**Applying** the network theorems for simplification of the electrical circuits.	
CO3.	**Analyzing** the two-port parameters with their inter-relationships and gaining the ability to solve with series, parallel and cascade connections	
CO4.	**Evaluating** the network functions, poles and zeroes from a given network and analyzing the network stability.	
CO5.	**Creating** the two element network, using passive elements through Foster and Cauer forms. Understanding the basics of filter design.	
Course Content:		
Unit-1:	**Graph Theory:** Graph of a Network, Definitions, Tree, Co-tree, Link, Basic loops and basic cut sets, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Node methods of analysis.	**8 Hours**
Unit-2:	**Network Theorem:** Superposition theorem; Thevenin's theorem; Norton's theorem; Maximum power transfer theorem; Reciprocity theorem; Millman's theorem; Compensation theorem; Tellegen's theorem.	**8 Hours**
Unit-3:	**Network Functions:** Concept of Complex frequency; Transform Impedances; Network functions of one-port and two-port networks; Concept of poles and zeros; Properties of driving point and transfer functions; Time response and stability from pole zero plot; Transient Analysis & initial Conditions.	**8 Hours**
Unit-4:	**Two Port Networks:** Characterization of LTI two-port networks Z, Y, ABCD and h parameters; Reciprocity and Symmetry; Inter-relationships between the parameters; Inter-connections of two port networks; Image parameters and characteristic impedance; Ladder and Lattice networks; T & π representation.	**8 Hours**
Unit-5:	**Network Synthesis:** Positive real function, Definition and properties; Properties of LC, RC and RL driving point functions; Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. Filters: Fundamentals of Passive and active filters; Low pass, High pass, Band pass, and Band elimination filters.	**8 Hours**
Text Book:	**1.** A. Chakrabarti "Circuit Theory", Dhanpat Rai & Co	
Reference Books:	**1.** M.E. Van Valkenburg "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd. **2.** W.H. Hayt & Jack E-Kemmerly "Engineering Circuit analysis", Tata McGraw Hill. 3. D. Roy Choudhary "Networks and Systems", Wiley Eastern Ltd. 4. Donald E. Scott "An Introduction to Circuit analysis: A System Approach", McGraw Hill Book Company. 5. Soni, Gupta "Circuit Analysis", Dhanpat Rai & Sons. *** Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	• https://nptel.ac.in/courses/108/105/108105159/ • https://onlinelibrary.wiley.com/journal/1097007x	

Course Code: EEE463	B. Tech (Electrical)- Semester-IV **Network Analysis & Synthesis (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** and verifying the network theorems like Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Tellegen's theorem etc. using trainer kits.	
CO2.	**Applying** the network theorems to electrical circuits with AC and DC sources.	
CO3.	**Analyzing** the pole zero plot of network functions for subsequent stability analysis.	
CO4.	**Analyzing** the frequency response of active and passive filters as well as RLC circuits.	
CO5.	**Evaluating** the transient responses of two element electrical circuits to standard input signals.	
Experiments:	**Note: Minimum ten experiments should be performed.**	
Experiment-1:	To verify the superposition theorem with DC and AC sources.	
Experiment-2:	To verify the Thevenin's theorem with DC and AC sources.	
Experiment-3:	To verify the Norton's theorem with DC and AC sources.	
Experiment-4:	To verify the Maximum power transfer theorem with DC & AC sources.	
Experiment-5:	To verify the Tellegen's theorem for two networks of the same topology.	
Experiment-6:	To verify the reciprocity theorem in a given network.	
Experiment-7:	To plot the pole-zero diagram of the given network.	
Experiment-8:	To determine the transient response for RL and RC circuits with step voltage input, under critically damped and over damped cases.	
Experiment-9:	To determine the frequency response for RLC (series& parallel) circuits with sinusoidal AC input Signal.	
Experiment-10:	To Study loading effect in the cascade connected Networks.	
Experiment-11:	To determine the frequency response of a Twin – T notch filter.	
Experiment-12:	To determine attenuation characteristics of a low pass/high pass active filters.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: ECS412	B. Tech (Electrical)- Semester-IV **Object oriented Programming using JAVA**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** classes, objects, members of a class and relationships among them needed for a specific problem.	
CO2.	**Understanding** Java application programs using OOP principles and proper program structuring.	
CO3.	**Applying** the concepts of polymorphism and inheritance.	
CO4.	**Creating** Java programs to implement error handling techniques using exception handling, AWT Packages, Swing Package.	
CO5.	**Creating** Java programs to implement database connectivity using JDBC.	
Course Content:		
Unit-1:	**Introduction to Java: Advantages of Java, Byte Code,** Java Virtual Machine, Data types, Variables, Control Statements: if, else, switch, loops; Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, Synchronization, String handling,	**8 Hours**
Unit-2:	**Applets:** Configuring applets, Applet capabilities and restrictions **Abstract Window Toolkit (AWT):** Controls, Layout managers, Menus, Images, Graphics. Java Class: Structure of a Class, Constructors, Polymorphism: Overloading and overriding methods, Garbage collection, Making methods and classes final, Abstract classes and methods.	**8 Hours**
Unit-3:	**Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.	**8 Hours**
Unit-4:	**Packages:** Package access. **Basic concepts of networking: Working** with URLs, Concepts of URLs, Sockets Cloning objects, **Wrapper classes:** Enumeration interface.	**8 Hours**
Unit-5:	**JDBC:** Connectivity Model, JDBC/ODBC Bridge, java. sql package, Connectivity to remote database, navigating through multiple rows retrieved from a database.	**8 Hours**
Text Books:	1. Kogent, "Object Oriented Programming Methodology" Kogent Learning Solutions Inc.	
Reference Books:	1. Booch Grady, "Object-Oriented Analysis & Design with Applications" 2. Jana, "Java and Object-Oriented Programming Paradigm. *** Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	https://www.youtube.com/watch?v=Lf_Vh-n8Faw https://www.youtube.com/watch?v=vJ-Zn4fo0MQ	

Course Code: ECS461	B. Tech (Electrical)- Semester-IV **Object oriented Programming using JAVA (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** the object-oriented approach in programming and analysing and designing a computer program to solve real world problems based on object-oriented principles.	
CO2.	**Applying** the basic approach of graphical user interface design using Abstract window toolkit, Applet and swing packages, creating some application that are based upon some real world scenario.	
CO3.	**Analysing** the concept of database handling and creating application that are able to communicate with various database.	
CO4.	**Analysing** the Client server architecture, Understanding the Socket programming architecture and creating basic application using Socket programming.	
CO5.	**Analysing** real world problems and Creating GUI based application that is able to solve those real world problems.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	To write a program in Java for illustrating overloading.	
Experiment-2:	To write a program in Java for illustrating over riding.	
Experiment-3:	To write a program in Java for illustrating Inheritance.	
Experiment-4:	To write programs to create packages and multiple threads in Java.	
Experiment-5:	To write programs in Java for event handling Mouse and Keyboard events.	
Experiment-6:	To create different applications using Layout Manager.	
Experiment-7:	To write programs in Java to create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT.	
Experiment-8:	To create Applets using Java.	
Experiment-9:	To write program for Client Server Interaction with stream socket connections.	
Experiment-10:	To write a program in java to read data from disk file.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EGP411	B.Tech- Semester-IV **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: TMUGA-401	Value Added Course B.Tech.- Semester-IV **Analytical Reasoning**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the arithmetical concepts in Ratio Proportion Variation.	
CO2.	Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance.	
CO3.	Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram.	
CO4.	Examining the optimized approach to solve logs and Surds.	
Course Content:		
Unit-1:	**Ratio, proportions and variations** Concept of ratios, proportions, variations, properties and their applications	**5 Hours**
Unit-2:	**Time and Work** Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns	**6 Hours**
Unit-3:	**Time Speed Distance** Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks	**6 Hours**
Unit-4:	**Logs and Surds** Concept and properties of logs, surds and indices	**4 Hours**
Unit-5:	**Coding and decoding** Sequential coding, reverse coding, abstract coding	**3 Hours**
Unit-6:	**Syllogisms** Two statements, three statements	**4 Hours**
Unit-7:	**Venn diagram** Basic concept and applications	**2 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: EEE511	B. Tech (Electrical)- Semester-V **Control Systems**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding**, demonstrating and understanding the fundamentals of (feedback) control systems.	
CO2.	**Applying** Solving the system equations in state-variable form (state variable models).	
CO3.	**Analysing**, determining the time and frequency-domain responses of first and second-order systems to step and sinusoidal (and to some extent, ramp) inputs.	
CO4.	**Evaluating**, determining the (absolute) stability of a closed-loop control system.	
CO5.	**Creating**, applying root-locus technique to analyse and design control systems.	
Course Content:		
Unit-1:	**Control Systems:** Open loop & closed control; Servomechanism; Physical examples; Transfer functions: Block diagram algebra, and Signal flow graph, Mason's gain formula; Reduction of parameter variation and effects of disturbance by using negative feedback.	**8 Hours**
Unit-2:	**Time Response Analysis:** Standard test signals; Time response of first and second order systems; Time response specifications; Steady state errors and error constants; Design specifications of second order systems; Derivative errors, Derivative output, Integral error and PID compensation; Design specifications for higher order systems; Performance indices.	**8 Hours**
Unit-3:	**Control System Components:** Constructional and working concept of AC Servomotor; Synchronous and stepper motor; Stability and Algebraic Criteria, Concept of stability and necessary conditions; Routh-Hurwitz criteria and limitations; Root Locus technique: Root Locus concepts, Construction of Root Loci.	**8 Hours**
Unit-4:	**Frequency response Analysis:** Frequency response, Correlation between time and frequency responses; Polar and inverse polar plots; Bode plots; Stability in frequency domain: Nyquist stability criterion, Assessment of relative stability, Gain margin and phase margin; Constant M&N circles.	**8 Hours**
Unit-5:	**Introduction to Design:** The design problems and preliminary considerations of lead, Lag and Lead-lag networks; Design of closed loop systems using compensation techniques in time and frequency domains. **Review of state variable technique:** Review of state variable technique, conversion of state variable model to transfer function model and vice-versa; Diagonalization; Controllability and Observability and their testing.	**8 Hours**
Text Book:	1. I.J. Nagrath & M. Gopal "Control System Engineering", New age International.	
Reference Books:	**1.** Norman S. Nise "Control System Engineering", Wiley Publishing Co. **2.** M. Gopal "Control System; Principle and design", Tata McGraw Hill. **3.** M. Gopal "Modern Control system", Tata McGraw Hill. **4.** K. Ogata "Modern Control Engineering", Prentice Hall of India. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	• https://nptel.ac.in/courses/107/106/107106081/ • https://www.tandfonline.com/toc/tssc/current	

Course Code: EEE561	B. Tech (Electrical)- Semester-V **Control Systems (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** the principles of control system engineering through laboratory experiment.	
CO2.	**Applying** the Electrical equipment, evaluating their functioning and assessing their Performance.	
CO3.	**Analyzing** the report based on performed experiments (journals) with effective demonstration.	
CO4.	**Analyzing** and connecting the circuit, measuring observed data and summarize.	
CO5.	**Evaluating** Root Locus and bode plot by using MATLAB software.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.	
Experiment-2:	To study P, PI and PID temperature controller and compare their performance.	
Experiment-3:	To study and calibrate temperature using resistance temperature detector (RTD).	
Experiment-4:	To design Lag compensator using Bode plot.	
Experiment-5:	To design Lead compensator using Bode plot.	
Experiment-6:	To design Lag, Lead and Lag-Lead compensators using Bode plot.	
Experiment-7:	To study DC position control system.	
Experiment-8:	To study synchro-transmitter and receiver and obtain output vs. input characteristics.	
Experiment-9:	To determine speed-torque characteristics of an ac servomotor.	
Experiment-10:	To study performance of a servo voltage stabilizer at various loads using load bank.	
Experiment-11:	To study the behavior of separately excited dc motor in open loop and closed loop conditions at various loads.	
Experiment-12:	To simulate second order system using PID controller and explore transportation lag.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE512	B. Tech (Electrical)- Semester-V **Power Electronics**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	Understanding the basics of Power Electronics components characteristics.	
CO2.	Understanding of the power semiconductor switches (Construction, Characteristics and operation).	
CO3.	Understanding the working of various types of phase converters.	
CO4.	Analysing the converters and deciding components of them, under various load types.	
CO5.	Evaluating and Controlling of various Inverter circuits.	
Course Content:		
Unit-1:	**Power Semiconductor Devices**: Types of power semiconductor devices, their symbols and static characteristics; Characteristics and specifications of switches; Types of power electronic Circuits; BJT operation: Steady state and switch characteristics, Switching limits; Operation and steady state characteristics of MOSFET and IGBT; Thyristor operation: V-I characteristics, Two transistor model, Methods of turn-on; Operation of GTO, MCT and TRIAC.	**8 Hours**
Unit-2:	**Power Semiconductor Devices (Contd.)**: Protection of devices; Series and parallel operation of thyristors; Commutation techniques of thyristor; DC-DC Converters: Principles of step-down chopper, step down chopper with R-L load, Principle of step-up chopper, Operation with RL load, classification of choppers.	**8 Hours**
Unit-3:	**Phase Controlled Converters:** Single-phase half-wave controlled rectifier with resistive and inductive loads, Effect of freewheeling diode; Single-phase fully-controlled and half-controlled bridge converters.	**8 Hours**
Unit-4:	**AC Voltage Controllers**: Principle of on-off and phase control single-phase ac voltage controller with resistive and inductive loads; Three-phase ac voltage controllers (various configurations and comparison); Single-phase transformer tap changer; Cyclo Converters: Basic principle of operation, Single-phase to single-phase, Three-phase to single-phase and three-phase to three-phase cyclo converters, output voltage equation.	**8 Hours**
Unit-5:	**Inverters**: Single phase series resonant inverter; Single phase bridge inverters; Three phase bridge inverters; Voltage control of inverters; Harmonics reduction techniques; Single phase and three phase current source inverters.	**8 Hours**
Text Book:	**1.** M. H. Rashid, "Power Electronics: Circuits, Devices & Applications", Prentice Hall of India, Ltd.	
Reference Books:	**1.** M.S Jamil Asghar, "Power Electronics", Prentice Hall of India Ltd. **2.** A Chakrabarti, "Fundamentals of Power Electronics & Drives", Chanpat Rai & Co. **3.** Babu K.Hari, "Power Electronics", Switch Publications. **4.** M.D. Singh & K.B. Khanchandani, "Power Electronics", Tata McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	• https://nptel.ac.in/courses/108/102/108102145/ https://www.springer.com/journal/43236	

Course Code: EEE562	B. Tech (Electrical)- Semester-V **Power Electronics (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the basic operation of various power semiconductor devices and passive components.	
CO2.	**Analyzing** power electronics circuits	
CO3.	**Applying** power electronic circuits for different loads	
CO4.	**Evaluating** various single phase and three phase power converter circuits and understand their applications.	
CO5.	**Creating** basic requirements for power electronics-based design application.	
Experiments:	**Note: A minimum of 10 experiments has to be performed out of which at least three should be from software based experiments.**	
Experiment-1:	To study V-I characteristics of SCR and measure latching and holding currents.	
Experiment-2:	To study UJT trigger circuit for half wave and full wave control.	
Experiment-3:	To study single-phase half wave-controlled rectifier with (i) Resistive load (ii) Inductive load with and without freewheeling diode.	
Experiment-4:	To study single phase (i) Fully controlled rectifier (ii) Half controlled bridge rectifier with resistive and inductive loads.	
Experiment-5:	To study three-phase (i) Fully controlled rectifier (ii) Half controlled bridge rectifier with resistive and inductive loads.	
Experiment-6:	To study single-phase AC voltage regulator with resistive and inductive loads.	
Experiment-7:	To study single phase Cyclo-converter.	
Experiment-8:	To study triggering of (i) IGBT (ii) MOSFET (iii) Power Transistor	
Experiment-9:	To study operation of (i) IGBT (ii) MOSFET with Chopper circuit	
Experiment-10:	To study MOSFET/IGBT based single-phase series-resonant inverter.	
Experiment-11:	To study MOSFET/IGBT based single-phase bridge inverter.	
Experiment-12:	To study V-I characteristics of SCR and measure latching and holding currents.	
	SOFTWARE BASED EXPERIMENTS (PSPICE/MATLAB)	
Experiment-13:	To simulate single-phase fully-controlled bridge rectifier using SCR and draw load voltage and load current waveforms for inductive load/RL load.	
Experiment-14:	To simulate single-phase fully-controlled bridge rectifier using GTO and draw load voltage and load current waveforms for inductive load/RL load.	
Experiment-15:	To simulate single-phase fully-controlled bridge rectifier using IGBT and draw load voltage and load current waveforms for inductive load/RL load.	
Experiment-16:	To simulate single-phase full-wave AC voltage controller SCR and draw load voltage and load current waveforms for inductive load/RL load.	
Experiment-17:	To simulate single-phase full-wave AC voltage controller MOSFET and draw load voltage and load current waveforms for inductive load/RL load.	
Experiment-18:	To simulate step down dc chopper with L-C output filter for inductive load and determine steady-state values and ripple contents of output voltage.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE513	B. Tech (Electrical)- Semester-V **Power System Analysis- I**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** the real time electrical transmission system with respect to various electrical parameters considering environmental and economic obligations.	
CO2.	**Applying** the basic mathematical, physical and electrical principles to formulate significant electrical hazards.	
CO3.	**Analysing** appropriate safety equipment's for design of electrical power system with enhancing the efficiency of the transmission and distribution system with environment friendly technology.	
CO4.	**Evaluating** suitability of installing overhead and underground power transmission strategies considering electrical, mechanical, environmental, performance, safety and economic constraints.	
CO5.	**Creating** the need to continuously follow the advancements in technology and incorporating them in the present system to improve efficiency, study of neutral grounding and Insulators.	
Course Content:		
Unit-1:	**Power System Components:** Single line Diagram of Power system; Brief description of power system Elements: Synchronous machine, Transformer, Transmission line, Bus bar, Circuit breaker and isolator. **Supply System:** Different kinds of supply system and their comparison, Choice of transmission voltage. **Transmission Lines:** Configurations; Types of conductors; Resistance of line; Skin and proximity effects.	**8 Hours**
Unit-2:	**Over Head Transmission Lines:** Calculation of inductance and capacitance of single-phase, three-phase, single-circuit and double-circuit transmission lines; Representation and performance of short, medium and long transmission lines; Ferranti effect; Surge impedance loading.	**8 Hours**
Unit-3:	**Corona and Interference:** Phenomenon of corona: Corona formation, Calculation of potential gradient, Corona loss, Factors affecting corona, Methods of reducing corona and interference; Electrostatic and electromagnetic interference with communication lines. **Overhead line Insulators:** Type of insulators and their applications; Potential distribution over a string of insulators: Methods of equalizing the potential, String efficiency.	**8 Hours**
Unit-4:	**Mechanical Design of transmission line:** Catenary curve; Calculation of sag & tension; Effects of wind and ice loading; Sag template; Vibration dampers. **Insulated cables:** Type of cables and their construction; Dielectric stress; Grading of cables; Insulation resistance; Capacitance of single-phase and three-phase cables; Dielectric loss; Heating of cables.	**8 Hours**
Unit-5:	**Neutral grounding:** Necessity of neutral grounding: Various methods of neutral grounding, Earthing transformer, grounding practices. **Distribution systems**: Radial and Ring main system, Current and voltage calculation in distributors with concentrated and distributed loads.	**8 Hours**
Text Book:	**1.** Ashfaq Hussain, "'Power System", CBS Publishers and Distributors.	
Reference Books:	1. M. V. Deshpandey, "Elements of Power System Design", Tata McGraw Hill, 2. Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons. 3. W. D. Stevenson, "Element of Power System Analysis", McGraw Hill	

	4. C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition 5. B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co. 6. M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/108/105/108105104/ https://www.tjprc.org/journals/tjprcinternational-journal-of-power-systems	

Course Code TMUGE501	B.Tech (Electrical)- Semester-V **English Communication – IV**	L-2 T-0 P-2 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Remembering** adequate knowledge of grammar and vocabulary through prescribed text to address competitive exams.	
CO2.	**Understanding** the value of listening to understand the basic content.	
CO3.	**Understanding** the usage of English grammar in day to day context.	
CO4.	**Understating** about the skills required in corporate world.	
CO5.	**Applying** writing and comprehensive skills in English.	
CO6.	**Creating** a simple proposal and report.	
Course Content:		
Unit-1:	**Vocabulary & Grammar** • Homophones and Homonyms • Correction of Common Errors (with recap of English Grammar with its usage in practical context.) • Transformation of sentences	**8 Hours**
Unit-2:	**Essence of Effective listening & speaking** • Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned* • Impromptu	**8 Hours**
Unit-3:	**Professional Writing** • Proposal: Significance, Types, Structure & AIDA • Report Writing: Significance, Types, Structure& Steps towards Report writing	**8 Hours**
Unit-4:	**Job Oriented Skills** • Cover Letter • Preparing Resume and Curriculum-Vitae • Interview: Types of Interview, Tips for preparing for Interview and Mock Interview • Corporate Expectation & Professional ethics: Skills expected in corporate world.	**8 Hours**
Unit-5:	**Value based text reading:** Short story • A Bookish Topic - R.K. Narayan	**8 Hours**
Text Books:	**1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi	
Reference Books:	**1.** Joseph, Dr C.J. & Myall E.G. "A *Comprehensive Grammar of Current English*" Inter University Press, Delhi **2.** Chaudhary Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi. **3.** Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi. ***Latest editions of all the suggested books are recommended.**	
Additional Electronics Reference Material	1- https://www.youtube.com/watch?v=dpYltVtsS_Q 2 - https://www.youtube.com/watch?v=QthdqIB0WS8 3 - https://www.youtube.com/watch?v=MrgHfK8Pcfk 4 - https://www.youtube.com/watch?v=860LtRxP3rw 5 - https://www.youtube.com/watch?v=0nN7Q7DrI6Q	
Methodology	**1.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion. **2.** Language Lab software. **3.** Sentence transformation on daily activities and conversations.	

	4. Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips) **5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.	

Evaluation Scheme

Internal Evaluation			**External Evaluation**		**Total Marks**
40 Marks			**60 Marks**		
20 Marks (Best 2 out of Three CTs) ***(From Unit - I, III, IV & V)***	10 Marks (Oral Assignments) ***(From Unit - II & IV)***	10 Marks (Attendance)	40 Marks (External Written Examination) ***(From Unit -I, III, IV & V)***	20 Marks (External Viva)* ***(From Unit -II & IV)***	**100**

*Parameters of External Viva

Content	**Body Language**	**Communication skills**	**Confidence**	**TOTAL**
05 Marks	05 Marks	05 Marks	05 Marks	20 Marks

***Note**: External Viva will be conducted by 2-member committee comprising*

- ***a)*** *One Faculty teaching the class*
- ***b)*** *One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

Course Code: EEC511	B.Tech (Electrical) - Semester-V **Microprocessor & Applications**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Remembering** the basic concept of digital fundamentals to Microprocessor based personal computer system.	
CO2.	**Understanding** the detailed s/w & h/w structure of the Microprocessor.	
CO3.	**Applying** the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.	
CO4.	**Analyzing** the properties of Microprocessors & Microcontrollers.	
CO5.	**Evaluating** the data transfer attributes through serial & parallel ports.	
CO6.	**Creating** practical modules based on assembly language programming for microprocessor.	
Course Content:		
Unit-1:	**Introduction to Microprocessor:** 8085 Evolution of Microprocessor, Register Structure, ALU, Bus Organization, Timing and Control, instruction set. Architecture of 16-bit Microprocessors: Architecture of 8086; (Bus Interface Unit, Execution unit) Register Organization, Bus operation, Memory segmentation.	**8 Hours**
Unit-2:	**Assembly Language Programming:** Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call), Loop and string instructions, Assembler Directives.	**8 Hours**
Unit-3:	**CPU Module:** Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode and Maximum Mode Operations.	**8 Hours**
Unit-4	**Peripheral Interfacing:** Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC.	**8 Hours**
Unit-5	**Peripheral Interfacing (Contd.)**: 8259 Programmable Interrupt controller, 8237 DMA controller Concept of Advanced 32 bit Microprocessors: Pentium Processor	**8 Hours**
Text Books:	**1.** Gaonkar Ramesh S., "Microprocessor Architecture, Programming, and Applications with the 8085", Pen Ram International Publishing.	
Reference Books:	**1.** Liu and Gibson G.A., "Microcomputer Systems: The 8086/8088 Family", Prentice Hall (India). **2.** Brey, Barry B., "INTEL microprocessors", Prentice Hall (India). **3.** Ram B., "Advanced Microprocessor & Interfacing", Tata McGraw Hill. **2.** Hall D.V, "Microprocessors Interfacing", Tata McGraw Hill. **3.** Ray, A.K. &Burchandi, K. M. "Advanced Microprocessors and Peripherals: Architecture Programming and Interfacing", Tata McGraw Hill. **4.** B.P. Singh &Renu Singh, "Microprocessors and Microcontrollers", New Age International **5.** U.S. Shah, "Microprocessor" Tech Max Publications ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/108/107/108107029/ https://www.youtube.com/watch?v=uKw8tB5Y7mE https://www.youtube.com/watch?v=t0Z8P_hpbFk	

Course Code: EEC561	B.Tech (Electrical) - Semester-V **Microprocessor & Applications (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Remembering** the basic concept of digital fundamentals to Microprocessor based personal computer system.	
CO2.	**Understanding** the detailed s/w & h/w structure of the Microprocessor.	
CO3.	**Applying** the different peripherals (8255, 8253 etc.) are interfaced with Microprocessor.	
CO4.	**Analyzing** the properties of Microprocessors & Microcontrollers.	
CO5.	**Evaluating** the data transfer attributes through serial & parallel ports.	
CO6.	**Creating** practical modules based on assembly language programming for microprocessor.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	Study of 8085 Microprocessor kit.	
Experiment-2:	Write a program using 8085 and verify for addition of two 8-bit numbers.	
Experiment-3:	Write a program using 8085 and verify for addition of two 8-bit numbers (with carry).	
Experiment-4:	Write a program using 8085 and verify for 8-bit subtraction (display borrow).	
Experiment-5:	Write a program using 8085 and verify for 16-bit subtraction (display borrow)	
Experiment-6:	Write a program using 8085 for multiplication of two 8- bit numbers by successive addition method.	
Experiment-7:	Study of 8086 microprocessor kit.	
Experiment-8:	Write a program using 8086 for multiplication of two 8- bit numbers.	
Experiment-9:	Write a program using 8086 for multiplication of two 16- bit numbers.	
Experiment-10:	Write a program using 8086 and verify for finding the smallest number from an array	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE592	B. Tech (Electrical)- Semester-V **Skill based Practical Training & Presentation**	L-0 T-0 P-0 C-2
Course Procedure:		
	Students will have to undergo Skill based Practical Training (Certificate course) of four weeks in any industry or reputed organization or training centre after the IV semester examination in summer. The evaluation of this certificate course shall be included in the V semester evaluation. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training. Students will receive certificate after completion his/her training which will be duly signed by the officer under whom training was undertaken in the industry/ organization/training centre. The student at the end of the V semester will present his/her presentation about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The presentation session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. The marks by the external examiner would be based on the presentation presented by the student which shall be evaluated by the external examiner and cross examination done of the student concerned.	
	The marking shall be as follows:	
Internal: 50 marks	By the Faculty Guide – 25 marks. By Committee appointed by the Director/Principal – 25 marks.	
External: 50 marks	By External examiner appointed by the University – 50 marks	

Course Code: EGP511	B.Tech- Semester-V **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: TMUGA-501	Value Added Course B.Tech.- Semester-V **Modern Algebra and Data Management**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System.	
CO2.	Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability.	
CO3.	Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data.	
CO4.	Correlating the various arithmetic concepts to check sufficiency of data	
Course Content:		
Unit-1:	**Number theory** Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity(Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes	**8 Hours**
Unit-2:	**Data interpretation** Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values	**7 Hours**
Unit-3:	**Data Sufficiency** Introduction of Data Sufficiency, different topics based DS	**5 Hours**
Unit-4:	**Permutations and combinations** Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements	**6 Hours**
Unit-5:	**Probability** Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: TMUGS-501	B.Tech- Semester-V **Managing Self**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Utilizing effective verbal and non-verbal communication techniques in formal and informal settings	
CO2.	Understanding and analyzing self and devising a strategy for self growth and development.	
CO3.	Adapting a positive mindset conducive for growth through optimism and constructive thinking.	
CO4.	Utilizing time in the most effective manner and avoiding procrastination.	
CO5.	Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree.	
CO6.	Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals.	
Course Content:		
Unit-1:	**Personal Development:** Personal growth and improvement in personality Perception Positive attitude Values and Morals High self motivation and confidence Grooming	**10 Hours**
Unit-2:	**Professional Development:** Goal setting and action planning Effective and assertive communication Decision making Time management Presentation Skills Happiness, risk taking and facing unknown	**8 Hours**
Unit-3:	**Career Development:** Resume Building Occupational Research Group discussion (GD) and Personal Interviews	**12 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Tracy, Brian, Time Management (2018), Manjul Publishing House 3. Hill, Napolean, Think and grow rich (2014), Amazing Reads 4. Scott, S.J., SMART goals made simple (2014), Create space Independent Pub 5. https://www.hloom.com/resumes/creative-templates/ 6. https://www.mbauniverse.com/group-discussion/topic.php 7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 8. Burne, Eric, Games People Play (2010), Penguin UK 9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Course Code: EEE611	B.Tech (Electrical)- Semester-VI **Electrical Drives & Controls**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** the concept of starting, Motoring and Braking in Electrical Motors.	
CO2.	**Applying** solid state drives for speed control of DC and AC machines.	
CO3.	**Analysing** the role of power electronics devices in control of speed, torque and other components.	
CO4.	**Evaluating,** Operating and maintaining solid state drives for speed control of 3 phase induction motor.	
CO5.	**Creating** the advantages and applications of various drive systems.	
Course Content:		
Unit-1:	**Fundamentals of Electric Drives:** Generalized block diagram; Choice of Electrical Drives; Dynamics of Electrical Drives; Four-Quadrant Operation of Drive Systems; Nature and Classification of Load Torques; Steady State and Transient Stability of Electrical Drive.	**8 Hours**
Unit-2:	**DC Motor Drives:** DC Motors and their characteristics, starting; Electrical braking of dc motors; Speed control, Control of DC motors by Single Phase Converters; Thyristor controlled Drives, Single Phase semi- and fully-controlled converters connected to DC separately excited and DC series Motors, Continuous and discontinuous current operation; Chopper Controlled DC drives, Speed control of DC separately excited and DC series Motors, Industrial applications. Microprocessor based control of DC Motor drives; PLL based Speed control of DC motor (Block Diagrams only).	**8 Hours**
Unit-3:	**Induction Motor Drives**: Three-phase induction motor analysis and Starting performance; Braking of induction motor; Speed control, Stator voltage control, Control of Induction Motor by AC voltage controllers, Waveforms, Speed torque characteristics, Variable frequency control.	**8 Hours**
Unit-4:	**Induction Motor Drives (Contd.):** Rotor Resistance Control, Rotor side Static rotor resistance control, Slip power recovery: Static Scheribus drive, Static Kramer Drive, Performance and speed torque characteristics, Advantages, Applications, and Problems; Rotor voltage injection method; Vector Control of induction motor.	**8 Hours**
Unit-5:	**Control of Synchronous Motors:** Separate control & Self-control of synchronous motors; Operation of self-controlled synchronous motors by VSI and CSI cyclo-converters; Load commutated CSI fed Synchronous Motor, Operation, Waveforms, Speed torque characteristics, Applications, Advantages and Numerical Problems; Closed Loop control operation of synchronous motor drives (Block Diagram Only).	**8 Hours**
Text Book:	1. G.K. Dubey, "Fundamentals of Electric Drives", Narosa Publications	
Reference Books:	1. B.K. Bose, "Modern Power Electronics and AC Drives", Prentice Hall of India. 2. Vedam Subramanyam, "Thyristor Control of Electric Drives", Tata McGraw Hill. 3. S. K. Pillai, "A First course on Electrical Drives", New Age International (P) Ltd. 2nd Edition. 4. M.H. Rashid, "Power Electronic Circuits, Devices and Applications", Prentice Hall of India.	

	5. M.D. Singh & K.B. Khanchandani, "Power Electronics", Tata McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	• https://nptel.ac.in/courses/108/104/108104140/ • https://www.inderscience.com/jhome.php?jcode=ijied	

Course Code: EEE661	B.Tech (Electrical)- Semester-VI **Electrical Drives & Controls (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the concept of working of AC motors to get speed torque characteristics at various operating points.	
CO2.	**Applying** the speed control of dc motors using dc chopper/ Single phase converters/Three phase converters.	
CO3.	**Analysing** and **E**exploring the field-weakening capabilities of the synchronous machine at higher speeds.	
CO4.	**Evaluating** the speed control of Single/ Three-phase induction motor using ac regulator.	
CO5.	**Creating** a set up of control strategies to synthesize the voltages in dc and ac motor drives.	
Experiments:	**Note: Minimum ten experiments should be performed from the following:**	
Experiment-1:	To measure the magnetization and short-circuit characteristics of the synchronous machine.	
Experiment-2:	To examine the external characteristics of the synchronous machine operating as a torque-controlled machine.	
Experiment-3:	To explore the field-weakening capabilities of the synchronous machine at higher speeds.	
Experiment-4:	To measure the basic operating characteristics of PM synchronous machines for comparison with those of the wound-field synchronous machine.	
Experiment-5:	To explore the characteristics of PM synchronous machines under torque control, including dynamic performance.	
Experiment-6:	To demonstrate the basis for flux weakening in PM machine in comparison to field weakening.	
Experiment-7:	To study the speed control of dc motor using dc chopper.	
Experiment-8:	To study the speed control of dc motor using single-phase converter.	
Experiment-9:	To study the speed control of dc motor using 3-phase converter.	
Experiment-10:	To study the speed control of single-phase induction motor using ac regulator.	
Experiment-11:	To study the speed control of three-phase induction motor using ac regulator	
Experiment-12:	To study the static rotor resistance control method in three-phase induction motor	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE612	B.Tech (Electrical)- Semester-VI **Power System Analysis-II**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** positive sequence, negative & zero sequence system and fault analysis.	
CO2.	**Applying** power system operation and stability control.	
CO3.	**Analysing** a power system network under Symmetrical Conditions.	
CO4.	**Evaluating** load flow computations and analysing the load flow results.	
CO5.	**Creating** computational models for analysing of power systems and understanding per unit system	
Course Content:		
Unit-1:	**Representation of Power System Components**: Synchronous machines; Transformers; Transmission lines; One-line diagram: Impedance and reactance diagram, p.u. System. **Symmetrical components**: Symmetrical Components: Unbalanced phasors, Power; Sequence impedances and sequence networks. **Symmetrical fault analysis**: Transient in R-L series circuit; Calculation of 3-phase short circuit current and Reactance of synchronous machine; Internal voltage of loaded machines under transient conditions.	**8 Hours**
Unit-2:	**Unsymmetrical faults**: Analysis of L-G fault, L-L fault and L-L-G fault on an unloaded generators and power system network with and without fault impedance; Formation of Z bus using singular transformation and algorithm; Algorithm based methods for short circuit calculations.	**8 Hours**
Unit-3:	**Load Flows Analysis:** Bus classifications; Nodal admittance matrix (Y bus); Development of load flow equations: Load flow solution using Gauss-Siedel and Newton-Raphson methods, approximation to N-R method; Line flow equations and fast decoupled method.	**8 Hours**
Unit-4:	**Power System Stability**: Stability and Stability limit: Steady state stability study, Derivation of swing equation, Transient stability studies by equal area criterion and step-by-step method, Dynamic stability studies, Factors affecting steady state and transient stability, Methods of improvement of stability.	**8 Hours**
Unit-5:	**Traveling Waves**: Wave equation for uniform Transmission line; Velocity of propagation; Surge impedance; Reflection and transmission of traveling waves under different line loadings; Bewlay's lattice diagram; Protection of equipment and line against traveling waves.	**8 Hours**
Text Book:	**1.** W.D. Stevenson, Jr. "Elements of Power System Analysis", Mc Graw Hill.	
Reference Books:	1. C.L. Wadhwa, "Electrical Power System", New Age International. 2. D. P. Kothari & Nagrath, "Modern Power System Analysis", Tata McGraw Hill. 3. A. Chakrabarti, M.L. Soni, P.V. Gupta & U.S. Bhatnagar, "Power System Engineering", Dhanpat Rai & Co. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	https://onlinecourses.nptel.ac.in/noc19_ee61/preview https://www.journals.elsevier.com/electric-power-systems-research	

Course Code: EEC619	B.Tech (Electrical)- Semester-VI **Analog and Digital Communication System**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** basic elements of a communication system.	
CO2.	Applying various angle modulation and demodulation techniques.	
CO3.	**Analysing** baseband signals in Amplitude modulation.	
CO4.	**Evaluating** the performance of modulation and demodulation techniques in various pulse modulation techniques.	
CO5.	**Creating** noise figure synchronisation in communication systems.	
Course Content:		
Unit-1:	**Introduction:** Basics of Communication, Basic elements of communication system, Definition of modulation, Need of modulation, Basic concept of demodulation.	**8 Hours**
Unit-2:	**Amplitude Modulation:** General expressions and waveforms of Double side band with Carrier (DSB-C), Double side band suppressed Carrier (DSB-SC), Single Side Band (SSB) modulation, AM spectrum, DSB-SC, DSB-C, SSB Modulators and Demodulators, Total power in AM, Vestigial Side Band (VSB) modulation.	**8 Hours**
Unit-3:	**Angle Modulation:** Basic definition of Frequency Modulation, Classification of FM on the basis of modulation index, General expression of Narrow band FM, Power of Narrow band FM, Carson's rule, Generation of FM by direct and indirect methods, Demodulation of FM by slope detector, Basic definition of Phase Modulation.	**8 Hours**
Unit-4:	**Pulse Modulation & Digital Transmission of Analog Signals:** Sampling Theorem, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, FDM, TDM.	**8 Hours**
Unit-5:	Introduction to Pulse Code Modulation (PCM), ASK, FSK, PSK, Delta modulation, Adaptive delta modulation.	**8 Hours**
Text Book:	1. H. Taube, D L Schilling, Goutam Saha, "Principles of Communication", Tata McGraw-Hill Publishing Company Ltd.	
Reference Books:	**1.** B.P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press. **2.** Simon Haykin, "Communication Systems",4th Edition, Wiley India. **3.** H. P. HSU & D. Mitra, "Analog and Digital Communications", Tata McGraw-Hill Publishing Company Ltd. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	https://www.youtube.com/watch?v=yGkV8ou1AeQ https://www.youtube.com/watch?v=JMOo--RY8wg	

Course Code: EHM613	B. Tech (Electrical)- Semester-VI **Human Values & Professional Ethics**	L-2 T-0 P-0 C-2
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the importance of value education in life and method of self-exploration.	
CO2.	**Understanding** 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration.	
CO3.	**Applying** right understanding about relationship and physical facilities.	
CO4.	**Analysing** harmony in myself, harmony in the family and society, harmony in the nature and existence.	
CO5.	**Evaluating** human conduct on ethical basis.	
Course Content:		
Unit-1:	Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration–content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics.	**8 Hours**
Unit-2:	Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study.	**8 Hours**
Unit-3:	Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship.	**8 Hours**
Unit-4:	Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence.	**8 Hours**
Unit-5:	Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems c) Ability to identify and develop appropriate technologies and management patterns for above production systems.	**8 Hours**

Text Book:	**1.** R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Value Education.	
Reference Books:	**1.** Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA 2. E.F. Schumacher, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain. **2.** A Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak. **3.** Sussan George, How the Other Half Dies, Penguin Press. Reprinted. **4.** PL Dhar, RR Gaur, Science and Humanism, Commonwealth Purblishers. **5.** A.N. Tripathy, Human Values, New Age International Publishers. **6.** E G Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	https://www.youtube.com/watch?v=Cnw1nK3K5qk https://www.youtube.com/watch?v=hTTCMrQyF8E	

Course Code: EEE665	B. Tech (Electrical)- Semester-VI **Modelling & Simulation using MATLAB-Simulink (Lab)**	L-0 T-1 P-2 C-2
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the MATLAB and Simulink environments.	
CO2.	**Applying** the available commands and toolboxes in understanding other courses of electrical engineering.	
CO3.	**Analysing** complex mathematical formulations using MATLAB software.	
CO4.	**Evaluating** different system responses through their plot and simulation results.	
CO5.	**Creating** state space, transfer function and block diagram models of dynamical systems and to simulate these models in MATLAB.	
Experiments:	**Note: Minimum ten experiments should be performed from the following:**	
Experiment -1:	Study of Introduction to MATLAB	
Experiment-2:	Single phase uncontrolled converter for R and RL load with capacitor filter using MATLAB / SIMULINK.	
Experiment-3:	Single phase fully controlled converter using R and RL load using MATLAB / SIMULINK.	
Experiment-4:	Three phase fully controlled converter using R and RL load using MATLAB / SIMULINK.	
Experiment-5:	Single Phase uncontrolled inverter using MATLAB / SIMULINK.	
Experiment-6:	Three Phase controlled inverter by PWM technique using MATLAB / SIMULINK.	
Experiment-7:	Single phase AC voltage regulator using MATLAB /SIMULINK.	
Experiment-8:	Study of basic matrix operations using MATLAB Software.	
Experiment-9:	Determination of Eigen values and Eigen vectors of a Square matrix using MATLAB Software.	
Experiment-10:	To solve linear equation using MATLAB Software	
Experiment-11:	Determination of roots of a polynomial using MATLAB Software	
Experiment-12:	Solution of Difference Equations using MATLAB Software.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Following contents will covered through class lectures:

	Course Content for Experiments:
1.	**MATLAB** - History & Introduction: Introduction to MATLAB - Overview of the MATLAB Environment - Current Trends in MATLAB - MATLAB in Various Departments - Examples for MATLAB Applications Various Departments - Advantages and Disadvantages of MATLAB - Scope Of MATLAB.
2.	**MATLAB Software Working Environment: MATLAB Initializing & Ending -** Quick Access Tool Bar - Command Window - Command History - Workspace Browser - Current folder window - Editor Window - Help Browser - Figure Window – Simulink Window - Creating Command Shortcuts - MATLAB Path Options MATLAB Programming – Debugging MATLAB codes.
3.	**MATLAB Graphics:** Scope, plots in workspace, 2-D Plot - Plotting Process - Creating a Graph – Exploring Data - Editing the Graph Components - Annotating Graphs - Printing and Exporting Graphs - Accessing Properties with the Property Inspector - Plotting Two Variables with Plotting Tools - Changing the Appearance of Lines and Markers - Placing Markers at Every Tenth Data Point ,Adding More Data to the Graph - To add data using the Plot Browser - Changing the Type of Graph - Modifying the Graph Data Source –Providing New Values for the Data Source - Figure Windows - Clearing the Figure for a New Plot - Controlling the Axes - Setting Axis Limits - Setting the Axis Aspect Ratio – Setting Axis Visibility - Setting Grid Lines.
4.	**Simulation:** Simulink Model windows, Simulation of Power Electronics circuits- Uncontrolled and controlled converters for R, RL, RLE type loads, Simulation of Electronics circuits – PWM Techniques.
5.	**Matrices:** Arrays – Matrix Representation-Matrix & Inverse of Matrix – Entry Retrieving - Matrix Division – Eigen values and vectors – Special matrices.
6.	**Polynomials:** Polynomial Overview - Representing Polynomials – Arithmetic operations on polynomials-Polynomial Roots - Polynomial coefficients – Polynomial Evaluation.
7.	**Solving Equations:** Solving Systems of Linear Equations - Solution to Differential Equations- Solving Second Order Differential Equations - Partial Fraction Expansion.

Course Code: EEC612	Program Elective-I B.Tech (Electrical) - Semester-VI **Embedded System**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** hardware and software design requirements of embedded systems.	
CO2.	**Understanding** the data types used in the programming of embedded system.	
CO3.	**Understanding** embedded systems related software architectures and tool chain.	
CO4.	**Analysing** the embedded system and develop software programs.	
CO5.	**Evaluating** the requirements of programming embedded systems.	
Course Content:		
Unit-1:	Basic difference between microprocessor, microcontroller and embedded, Introduction to AVR**,** General purpose registers in AVR, AVR data memory, AVR status registers.	**8 Hours**
Unit-2:	Instructions with data memory, Branch instructions and looping, call instructions and stack, AVR time delay and instruction pipelining & RISC architecture in AVR	**8 Hours**
Unit-3:	Introduction to AVR assembly programming, Input output programming in AVR, Input output bit manipulation programming, Arithmetic, logic instructions and programmes.	**8 Hours**
Unit-4:	AVR programming in C: Data types and time delays in C, Input /output programming in C, Logic operations in C, Data conversion programs in C, Data serialization in C, Memory allocation in C.	**8 Hours**
Unit-5:	AVR timer programming in assembly and C programming timers 0,1,2, counter programming, AVR interrupts & programming, AVR serial ports& programming.	**8 Hours**
Text Books:	1. Muhhmad Ali Mazidi, SarmadNaimi, SepehrNaimi. "The AVR Microcontroller and Embedded Systems using Assembly and C"Pearson Education .	
Reference Books:	**1.** Rajkamal Embedded Systems, TMH. **2.** David Simon Embedded systems software primer, Pearson **3.** Steve Furber, ARM System-on-Chip Architecture, Pearson **4.** Jean J Labrose, Micro C/OS-II, Indian Low Price Edition **5.** DR.K.V.K.K. Prasad, Embedded/Real Time System, Dreamtech **6.** Iyer, Gupta, Embedded Real Systems Programming, TMH ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/108/102/108102045/ https://www.youtube.com/watch?v=csttt3VHxf8	

Course Code: EEC617	Program Elective-I B.Tech (Electrical) - Semester-VI **Microcontroller Hardware, Programming & its Application (Arduino)**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Remembering** the concept of data types and programming syntax used in arduino.	
CO2.	**Understanding** the Microcontroller internal architecture and its operation within the area of controlling hardware using software.	
CO3.	**Applying** programming skills to design electrical circuitry to the Microcontroller I/O ports in order to interface the processor to external devices.	
CO4.	**Analyzing** the interfacing of a microcontroller system to user controls and other electronic systems.	
CO5.	**Creating** small projects using different sensor modules.	
Course Content:		
Unit-1:	**Getting started with Arduino:** Introduction and Familiarization to Arduino, pin structure of Arduino Uno, different types of Arduino, Setup your computer to use Arduino, Download and Install the Arduino IDE, Arduino IDE and Sketch Overview, Understanding Arduino Syntax Module, Understanding and Using Variables, Reading Analog Pins and Converting the Input to a Voltage Understanding electronics elements – Resistors, capacitors, transistors, relays. Arduino & LEDs interfacing, Blinking of LEDs, Fading of LED, Circling of LEDs. Blinking of EVEN and ODD states of LEDs, Traffic light system.	**8 Hours**
Unit-2:	**Serial monitoring:** Controlling of LEDs from your computer, reading analog and digital inputs, Controlling LED using pushbutton, Switching ON a relay. If-Else Statement, Comparison Operators and Conditions, For Loop Iteration, how to Use Arrays, Switch Case Statement, While Statement.	**8 Hours**
Unit-3:	**Analog inputs:** Controlling of LEDs using a joy stick, controlling a DC motor, PWM, Changing the brightness of LEDs using potentiometers. **LCD displays:** Wiring of LCD screen with Arduino, displaying a message in LCD screen, Screen navigation on LCD, Turn ON a LED by entering the password, Knowing the status of the LED, scrolling of text, Displaying room temperature.	**8 Hours**
Unit-4:	**Seven segment display:** Simple automatic countdown and count up. Increment or decrement a number by using pushbutton. Introduction to servomotor, Controlling Servo Motor with Joystick, Indexing of Servomotor, Direction control of ServoMotor, Synchronizing 2 ServoMotors.	**8 Hours**
Unit-5:	Interfacing with Sensor modules: HC-SR04 Ultrasonic Module, IR Infrared Obstacle Avoidance Sensor Module, Soil Hygrometer Detection Module Soil Moisture Sensor, Microphone Sensor, MQ-2Gas Sensor Module Smoke Methane Butane Detection, Humidity and Rain Detection Sensor Module, Speed Sensor Module, IR Infrared Flame Detection Sensor Module, HC-SR501 Pyroelectric Infrared Sensor Module, Accelerometer Module, DHT11 Temperature and Humidity Sensor, HC-05 Bluetooth module.	**8 Hours**

Text Book:	1. Simon Monk "Programming Arduino; Getting started with sketchs", Tata McGraw Hill.	
Reference Books:	1.J.M. Hughes "Arduino: A technical reference", O'Reilly Media, Inc. 2.Jeremy Blum "Exploring Arduino", Wiley Publishing Co. ***Latest editions of all the suggested books are recommended.**	
Additional Electronic Reference Material:	https://nptel.ac.in/courses/106/105/106105166/ https://www.youtube.com/watch?v=cAKnTSJb-SE https://www.youtube.com/watch?v=k_XWbVzJLIo	

Note-To introduce experimental and project learning the CT1 evaluation will be based on theoretical and programming knowledge and CT2 ,CT3 evaluation will be based on small working projects.

External exam will be the test for theoretical and programming evaluation on embedded C specific to arduino.

*Tutorial will be programming exercise with hands-on work on small projects.
*Advice- In group of 3 to 5 students will get arduino boards & laptop for practice during tutorial.

Course Code: EEE621	Program Elective-II B.Tech (Electrical) - Semester-VI **Advanced Control System**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** non-linear system behavior by phase plane and describing function methods.	
CO2.	**Applying** discrete-time mathematical models in both time domain (difference equations, state equations) and z domain (transfer function using z-transform).	
CO3.	**Analyzing** the stability analysis of nonlinear systems by Lyapunov method develops design skills in optimal control problems.	
CO4.	**Evaluating**, Predicting and analyzing transient and steady-state responses and stability and sensitivity of both open-loop and closed-loop linear, time-invariant, discrete-time control systems.	
CO5.	**Creating** state space and state feedback in modern control systems, pole placement, design of state observers and output feedback controllers.	
Course Content:		
Unit-1:	**INTRODUCTION:** Modern Vs Conventional Control theory Concept of linear vector space, Linear Independence, Bases & Representation, domain and range, Concept of linearity, relaxedness, time invariance, Casuality, Concept of state, state variable, state vector**.**	**8 Hours**
Unit-2:	**STATE APPROACH OF CONTROL SYSTEM ANALYSIS:** Concept of state space, state space equations, Writing state space equations of mechanical, electrical systems, analogous systems. **STATE SPACE REPRESENTATION**: Analyses using Physical and phase variables, comparison form of system representation, Block diagram representation of state model, Signal Flow Graph representation, state space representation using canonical variables, Diagonal matrix. Jordan canonical Form, derivation of transfer function from state model.	**8 Hours**
Unit-3:	**SOLUTION OF STATE EQUATIONS**: Diagonalization, Eigen values and eigen vectors, Matrix exponential, state transition matrix, properties of state transition matrix. Computation of state transition matrix, Concepts of controllability & observability, pole-placement by state feedback, Ackerman's formula.	**8 Hours**
Unit-4:	**NONLINEAR SYSTEMS:** Introduction, Common physical Non linearities, The Phase-plan method: Basic Concepts, Singular points, Stability of nonlinear system, Construction of Phase trajectories, the describing function method, Derivation of describing functions, Stability analysis by Describing function method, Jump Resonance.	**8 Hours**
Unit-5:	**DIGITAL CONTROL SYSTEMS:** Introduction, sampled-data control system, signal reconstruction, Difference equations, The z-Transform, Z-Transfer function, Block diagram analysis of sampled data system, z-and s domain relationship, Digital PID controllers.	**8 Hours**
Text Book:	1. I J Nagrath and M Gopal; Control systems Engineering, 3rd Ed, New Age Publication.	
Reference Books:	**1.** Katsuhiko Ogata: Modern control engineering. PHI **2.** M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997. **3.** B. C. Kuo, "Automatic Control System", Prentice Hall, 1995. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	• https://nptel.ac.in/courses/108/103/108103007/ • https://onlinelibrary.wiley.com/journal/10991239	

Course Code: ECS611	Program Elective-II B. Tech (Electrical)- Semester-VI **Database Management System**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of Database Management System	
CO2.	**Applying** the commercial relational database system (Oracle).	
CO3.	**Applying** the relational algebra expressions for queries.	
CO4.	**Applying** the basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.	
CO5.	**Analysing** the issues of transaction processing and concurrency control.	
Course Content:		
Unit-1:	**Introduction:** Scope and purpose of database system, view of data, relational databases, database architecture, transaction management, database system Vs file system, Database system concept and architecture, data definitions language, DML. **Data Models**: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction	**8 Hours**
Unit-2:	**Database design and ER Model**: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity etc, Codd's rules, Relational Schemas, Introduction to UML, Relational database model: Logical view of data, keys, integrity rules. Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF)	**8 Hours**
Unit-3:	**Relational data Model and Language**: Relational algebra: introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, Relational comparison. Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, Computational capabilities, constraints, Views. **Introduction on SQL**: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, and Procedures in SQL/PL SQL.	**8 Hours**
Unit-4:	Usage of Oracle: **1.** Installing oracle **2.** Creating Entity-Relationship Diagram using case tools. **3.** Writing SQL statements Using ORACLE **4.** MYSQL: a) Writing basic SQL SELECT statements. b) Restricting and sorting data. c) Displaying data from multiple tables. d) Aggregating data using group function. e) Manipulating data. f) Creating and managing tables. **5.** Normalization in ORACLE. **6.** Creating cursor in oracle. **7.** Creating procedure and functions in oracle. **8.** Creating packages and triggers in oracle.	**8 Hours**

Unit-5:	Transaction management: ACID properties, serializability and concurrency control Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	**8 Hours**
Text Books:	**1.** Elmasri, R., Navathe, S., Fundamentals of Database Systems, Addison-Wesley. **2.** G. K. Gupta, "Data Base Management", Tata Mc Graw Hill. **3.** Atul Kahate, "Introduction to Database Management Systems" Pearson Education, New Delhi, 2006. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	https://www.youtube.com/watch?v=wkOD6mbXc2M https://www.youtube.com/watch?v=siKBrudOYwo	

Course Code: EEE 620	Program Elective- II B.Tech - Semester-VI **Artificial Neural Network**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the concepts of Artificial Intelligence and Neural Network.	
CO2.	**Understanding** the concepts of different types Layer Feed Forward Neural Networks	
CO3.	**Applying** Biological and Artificial Neuron Models, and various Learning strategies.	
CO4.	**Analyzing** Perceptron Models and Training Algorithms.	
CO5.	**Evaluating** problems through BAM Training Algorithms: Storage and Recall Algorithm	
Course Content:		
Unit-1:	**Artificial Intelligence:** Issues, Techniques, Problems, Problem solving state space search; DFS; BFS Production: System, Problem characteristics; Heuristic Search Techniques; generate and Test; Hill Climbing; Best First Search; Constraint satisfaction.	**8 Hours**
Unit-2:	**Knowledge representation**: Approaches; Issues; Representing simple facts in logic; Resolution and natural deduction; Representing knowledge using rules; Procedural vs. Declarative knowledge; Forward v/s Backward chaining. **Slot and Filler Structures:** Semantic nets; Frames; Conceptual dependency; Scripts; parsing techniques.	**8 Hours**
Unit-3:	**Introduction to Neural Network:** Introduction, Organization of the Brain, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Potential Applications of ANN. **Essentials of Artificial Neural Networks:** Artificial Neuron Model, Types of Neuron Activation Function, ANN Architectures, Learning Strategy (Supervised, Unsupervised, Reinforcement).	**8 Hours**
Unit-4	**Single Layer Feed Forward Neural Networks:** Introduction, Perceptron Models and Training Algorithms. **Multilayer feed forward Neural Networks:** Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training.	**8 Hours**
Unit-5	**Expert System:** Definition and Characteristics; Expert system life cycle & Expert system tools; MYCIN & DENDRAL. **Associative Memories:** Paradigms of Associative Memory, Pattern Engineering, Hebbian Learning, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Architecture of Hopfield Network.	**8 Hours**
Text Book:	**1.** S. Rajasekharan and G. A. Vijayalakshmipai, Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications, PHI Publication.	
Reference Books:	**1.** "Simon Haykin, Neural Networks- A comprehensive foundation, Pearson Education. **2.** S.N. Sivanandam, S. Sumathi,S. N. Deepa, Introduction to Neural Networks using MATLAB 6.0", TMH. **3.** James A Freeman and Davis Skapura, Neural Networks Pearson Edu. **4.** Timothy J. Ross, Fuzzy Logic with Engineering Applications, McGraw-Hill Inc. **5.** E Rich. and K Knight, "Artificial Intelligence", Tata McGraw Hill. ***Latest editions of all the suggested books are recommended.**	

Additional electronics reference material	**https://nptel.ac.in/courses/117/105/117105084/** **https://www.youtube.com/watch?v=8cIbgCWRoYo**	

Course Code: ECS 631	**Program Elective- II** **B.Tech - Semester-VI** **Network security & cryptography**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the most common type of cryptographic algorithms used to provide confidentiality, integrity and authenticity.	
CO2.	**Understanding** different types of cryptosystems.	
CO3.	**Applying** different approaches of Network security.	
CO4.	**Analyzing** modes of operation for block ciphers.	
CO5.	**Evaluating** different hash functions in Information Security.	
CO6.	**Creating** mechanisms for electronic mail security.	
Course Content:		
Unit-1:	**Network Security:** Attacks; Services & Mechanisms; Conventional Encryption: Classical Encryption Techniques, Steganography.	**8 Hours**
Unit-2:	**Encryption Schemes:** DES: Standard, Strength; Block Cipher Design Principles; Block Cipher Modes of Operation: Triples DES; Key Distribution, Random Number Generation.	**8 Hours**
Unit-3:	**Public-Key Cryptography:** Principles; RSA Algorithm; Key Management; Fermat's & Euler's Theorems; Primarily Miller Test; Chinese Remainder Theorem.	**8 Hours**
Unit-4	**Message Authentication & Hash Functions:** Authentication: Requirements, Protocols, Introduction to Message Authentication Codes and Hash Functions, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signature.	**8 Hours**
Unit-5	**IP Security:** Electronic Mail Security; Pretty Good Privacy (PGP); S/MIME; Authentication Header; Encapsulating Security Payloads. **Web Security:** Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set);	**8 Hours**
Text Book:	**1.** Stallings, W., Cryptography and Network Security: Principles and Practice, Prentice Hall.	
Reference Books:	**1.** Johannes, A. B., Introduction to Cryptography, Springer. 2. Kahate, A., Cryptography and Network Security, Tata McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronics reference material	**https://onlinecourses.nptel.ac.in/noc20_cs21/preview** **https://www.youtube.com/watch?v=9X1rSWLFhLY&list=PL9FuOtXibFj8**	

Course Code: EGP611	B.Tech- Semester-VI **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: TMUGA-601	Value Added Course B.Tech.- Semester-VI **Advance Algebra and Geometry**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions.	
CO2.	Illustrating the different concepts of Height and Distance and Functions.	
CO3.	Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems.	
CO4.	Correlating the various arithmetic and reasoning concepts in checking sufficiency of data.	
Course Content:		
Unit-1:	**Clocks and calendars** Introduction , Angle based , faulty Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year	**5 Hours**
Unit-2:	**Set theory** Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams	**4 Hours**
Unit-3:	**Heights and Distance** Basic concept, Word problems	**3 Hours**
Unit-4:	**Functions** Introduction to Functions, Even and Odd Functions, Recursive	**3 Hours**
Unit-5:	**Problem Solving** Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable	**6 Hours**
Unit-6:	**Data Sufficiency** Introduction, Blood relation based, direction based, ranking based	**5 Hours**
Unit-7:	**Crypt Arithmetic** Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic, Company Specific Pattern	**4 Hours**
Reference Books:	• R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude • R2:-Quantitative Aptitude by R.S. Agrawal • R3:-M Tyra: Quicker Maths • R4:-Nishith K Sinha:- Quantitative Aptitude for CAT • R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com • R6:-Logical Reasoning by Nishith K Sinha • R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal *** Latest editions of all the suggested books are recommended.**	

Course Code: TMUGS-601	B.Tech - Semester-VI **Managing Work and Others**	L-2 T-1 P-0 C-0
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	Communicating effectively in a variety of public and interpersonal settings.	
CO2.	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change.	
CO3.	Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships.	
CO4.	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust.	
CO5.	Handling difficult situations with grace, style, and professionalism.	
Course Content:		
Unit-1:	**Intrapersonal Skills:** Creativity and Innovation Understanding self and others (Johari window) Stress Management Managing Change for competitive success Handling feedback and criticism	**8 Hours**
Unit-2:	**Interpersonal Skills:** Conflict management Development of cordial interpersonal relations at all levels Negotiation Importance of working in teams in modern organisations Manners, etiquette and net etiquette	**12 Hours**
Unit-3:	**Interview Techniques:** Job Seeking Group discussion (GD) Personal Interview	**10 Hours**
Reference Books:	1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education 2. Burne, Eric, Games People Play (2010), Penguin UK 3. Carnegie, Dale, How to win friends and influence people (2004), RHUK 4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan 5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com 6. https://www.hloom.com/resumes/creative-templates/ 7. https://www.mbauniverse.com/group-discussion/topic.php 8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression *** Latest editions of all the suggested books are recommended.**	

Course Code: EEE711	B. Tech (Electrical)- Semester-VII **Switchgear & Protection**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the working of different types of switchgear equipment's like circuit breakers and relays.	
CO2.	**Applying** fundamental engineering knowledge to obtain solutions associated with relay operation	
CO3.	**Analysing** with over current, differential, and Distance protection devices and their application in a coordinated protection scheme.	
CO4.	**Evaluating** and analysis the over current.	
CO5.	**Creating** models of various protection schemes and predict its performance.	
Course Content:		
Unit-1:	**Introduction to Protection System**: Introduction to protection system and its elements: Functions of protective relaying, Protective zones, Primary and backup protection, Desirable qualities of protective relaying, Basic terminology; Relays: Electromagnetic, attracted armature type and induction type relays, Thermal relay, Gas actuated relay, Design considerations of electromagnetic relay.	**8 Hours**
Unit-2:	**Relay Applications and Characteristics**: Amplitude and phase comparators: Over current relays, Directional relays, Distance relays, Differential relays, **Static relays:** Comparison with electromagnetic relays, Classification and their description, Over current relays, Directional relay, Distance relays, Differential relay.	**8 Hours**
Unit-3:	**Protection of Transmission Line**: Over current protection; Distance protection; Pilot wire protection; Carrier current protection; Protection of bus; Auto reclosing.	**8 Hours**
Unit-4:	**Circuit Breakers**: Properties of arc: Arc extinction theories, Restricting voltage transient, Current chopping, Resistance switching, Capacitive current interruption, Short line interruption; Circuit breaker ratings; Classification; Circuit Breakers: Operating modes, Selection of circuit breakers, Constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF_6, Vacuum and D. C. circuit breakers.	**8 Hours**
Unit-5:	**Apparatus Protection and testing of Circuit Breakers**: Protection of transformers, generators and motors; Testing of Circuit Breakers: Testing station and equipment, Testing procedure, Direct and indirect testing.	**8 Hours**
Text Book:	**1.** S. S Rao., "Switchgear and Protection", Khanna Publishers.	
Reference Books:	**1.** B. Ravindranath. &M. Chander, "Power System Protection and Switchgear", Wiley Eastern. **2.** J. L. Blackburn, "Protective Relaying: Principles and Applications", Marcel Dekker, New York, 1987. 3. Y. G.Paithankar and S. R. Bhide, "Fundamentals of power system protection", Prentice Hall, India, 2010. 4. A. G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", John Wiley & Sons, 1988. 5. A. G. Phadke and J. S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer, 2008.	

	6. D. Reimert, "Protective Relaying for Power Generation Systems", Taylor and Francis, 2006. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/108/101/108101039/ http://iaras.org/iaras/journals/ijps	

Course Code: EEE761	B. Tech (Electrical)- Semester-VII **Switchgear & Protection (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** gathered knowledge to assemble the circuit connections required to perform the Experiment, taking observations and analyzing the data to make valid conclusions.	
CO2.	**Applying** and verifying the principles of Switchgear & Protection through Laboratory Experimental Work.	
CO3.	**Analyzing** & Demonstrating the magnetization characteristics of current transformer and identify the problems associated with CT saturation.	
CO4.	**Creating** and Elucidate various protection schemes of various power system components like transformers.	
CO5.	**Creating** the operation of rewritable Fuse, Biased Differential Relay & Earth fault sensing Relay.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	To study the relaying and control circuits components.	
Experiment-2:	To plot operating characteristics of inverse time over-current relay.	
Experiment-3:	To plot operating characteristics of the differential relay.	
Experiment-4:	To plot operating characteristics of the MHO distance relay.	
Experiment-5:	To study the combined over-current & earth fault protection scheme of alternator.	
Experiment-6:	To study the transformer protection using differential relay.	
Experiment-7:	To plot the characteristic of Kit-Kat fuses and MCB.	
Experiment-8:	To study the oil arc extinction phenomenon.	
Experiment-9:	To demonstrate the microprocessor base protection for 3-phase induction motor.	
Experiment-10:	To demonstrate the microprocessor base protection for 1-phase induction motor.	
Experiment-11:	To demonstrate the microprocessor base protection for 3-phase alternator motor.	
Experiment-12:	To study the different types of fuses.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE712	B. Tech (Electrical)- Semester-VII **Non-Conventional Energy Resources**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** about non-conventional sources of energy technologies.	
CO2.	**Applying** knowledge for development based upon different energy resources.	
CO3.	**Analysing** the various concepts behind renewable energy resources.	
CO4.	**Evaluating** the need of different renewable energy sources and their importance	
CO5.	**Creating** awareness about the major environmental issues based on Non-Conventional Energy Resources for a sustainable development.	
Course Content:		
Unit-1:	Introduction: World energy use; Reserves of energy resources; Energy cycle of the earth; Environmental aspects of energy utilization; Renewable energy resources and their importance.	**8 Hours**
Unit-2:	Solar Energy: Introduction; Extra-terrestrial solar radiation; Radiation at ground level; Collectors; Solar cells; Applications of solar energy. Biomass Energy: Introduction; Biomass Conversion; Biogas Production; Ethanol Production; Pyrolysis and Gasification; Direct Combustion; Applications.	**8 Hours**
Unit-3:	Wind, Geo-Thermal and Hydro Energy Sources: Introduction; Basic theory; Types of turbines; Geothermal Energy Resources; Resource based applications for heating and electricity generation; Hydropower basic concepts; Site selection; Types of turbines; Small scale hydropower.	**8 Hours**
Unit-4:	Tidal Energy: Introduction; Origin of tides; Power generation schemes; Basic theory of Wave energy; Wave power Devices; Open and Closed OTEC cycles.	**8 Hours**
Unit-5:	Other Renewable Energy Sources: Ocean Currents; Salinity Gradient Devices; Environmental Aspects; Potential impacts of harnessing the different renewable energy resources.	**8 Hours**
Text Book:	**1.** G D Rai, Non-Conventional Energy Sources, Khanna publishers.	
Reference Books:	**1.** A. Duffie and W. A. Beckmann, "Solar Engineering of Thermal Processes", John Wiley **2.** F. Kreith and J. F. Kreider, "Principles of Solar Engineering", McGraw-Hill **3.** T. N. Veziroglu, "Alternative Energy Sources", McGraw-Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/121/106/121106014/ https://www.ijrer.org/ijrer/index.php/ijrer/	

Course Code: EEC761	B.Tech (Electrical) - Semester-VII **Electronics Devices & Circuits (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Analysing** the working of lab equipment and characteristics of basic components of electronic circuits.	
CO2.	**Analysing** the circuits using PN Junction diode.	
CO3.	**Analysing** input-output characteristics and frequency response of circuits using BJT & FET.	
CO4.	**Analysing** circuits of the amplifiers and oscillators.	
CO5.	**Creating** mini projects based on concept of electronics circuit.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	To Study the lab equipment and components: CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.	
Experiment-2:	To study the characteristics of Zener diode.	
Experiment-3:	To study the characteristic of BJT.	
Experiment-4:	To study the characteristic of FET.	
Experiment-5:	To study the applications of Op-amp.	
Experiment-6:	To study &plot the gain in dB Vs frequency of FET.	
Experiment-7:	To study the design of single RC coupled amplifier.	
Experiment-8:	To study &plot the gain Vs frequency of two stage amplifier.	
Experiment-9:	To study the common collector configuration-emitter follower using Darlington pair.	
Experiment-10:	To study the power amplifier and its gain characteristics.	
Experiment-11:	To study & implement the transistor differential amplifier and plot its non ideal characteristics.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC762	B.Tech (Electrical) - Semester-VII **Design and Installation of Solar Photovoltaic System (Lab)**	L-0 T-1 P-2 C-2
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** basics of solar energy.	
CO2.	**Applying** methods Risk Management and to ensure safety and performance.	
CO3.	**Analysing** everything on Solar Modules, Optimizers (DC/DC converters), Junction Boxes, Inverters, Solar Meters, Learn all the fundamentals of Solar PV energy, Applications of Solar PV Systems, Advantages and Disadvantages of Solar photovoltaic energy.	
CO4.	**Analysing** Grid-Tie PV System, Calculating Solar Array size, Installing, Maintaining and Servicing of solar power plant.	
CO5.	**Analysing** the Power concepts & Units.	
Course Content:		
Unit-1:	**Basics of PV Technology:** What is Solar Energy, Solar Collectors, Photovoltaic Systems, History of Photovoltaics, Photovoltaic Effect, Photovoltaic Cells, PV Modules and Arrays. **Solar PV technology overview:** How does PV technology work, Other Types of Photovoltaic Technology, Costs of Solar Photovoltaics, Modern Photovoltaics. **Fundamentals of Solar Components Solar PV System**: Solar Radiation, Solar Cell Parameters and Equivalent Circuit, Losses and Efficiency Limits, Crystalline Silicon Solar Cells, Thin-film solar cells, PV System Design. **Site survey, assessment & feasibility study:** PV Site Location, Assumptions and Input Data for Analysis, Potential Rate Increases, Conclusions and Recommendations.	**T Hrs-4.5, P Hrs - 3.5**
Unit-2:	**Assess the customer's Solar PV requirement:** pv cost considerations, permits and covenants, stand-alone small solar electric systems, grid-connected small solar electric systems, estimating energy cost savings for net-metered pv system. **Capacity or system sizing approach:** Solar PV system sizing, determine power consumption demands, Inverter sizing, Battery sizing, available area for installation of SPV. **Design of SPV Plant**s: Load estimation, Estimation of number of PV panels, Estimation of battery bank, Cost estimation of the system.	**T Hrs-4, P Hrs -5**
Unit-3:	**Preparation of Bill of Materials (BoM)**:Mechanical or electrical components used to assemble or integrate major components, Size of the Plant, Type of Roof, Module Make and Specs, Inverter Make and Specs, Whether Remote Monitoring is separately required. **Installation, Maintenance and Service of SPV Plants**: Modularity & scalability, Flexible location. **Civil and Mechanical parts of Solar PV System**: Get Equipment Foundation constructed, Install Mounting System, Install Photovoltaic modules, Install Battery Bank Stand and Inverter Stand.	**T Hrs-4, P Hrs -5**
Unit-4	**Electrical components of Solar PV System**: Install Array JB, cost effective wiring, Using MCCBs and other essential components. **Advanced Solar Power plant Engineering**: Photovoltaic Inverter Topologies for Grid Integration Applications, Advanced Control Techniques for PV Maximum Power Point Tracking, Maximum Power Point Tracking Methods for PV Systems, Photovoltaic Multiple Peaks Power Tracking Using Particle, Swarm Optimization with Artificial Neural Network Algorithm **Intro – Google Sketch up, PV Syst, AutoCAD**: Creation of a grid-connected project, Construction and use of 3D shadings scenes, Meteorological data in PV-syst.	**T Hrs-6, P Hrs -5**

Unit-5	**Solar project development phases and issues**: Initiation phase, Definition phase, Design phase, Development phase, Implementation phase, Follow-up phase. **Project planning and schedule of activities:** Management activities**,** Project planning, Project scheduling, Risk management, Risk identification, Risk analysis, Risk planning, Risk monitoring **Best practices in design & installation to ensure safety and performance**: Work History, Financial Transparency, Health and Safety, Insurance.	**T Hrs-7, P Hrs -1**

Evaluation of Practical Examination:

Internal Evaluation (50 marks)

Each experiment (Min. 06 experiment) would be evaluated by external trainer or by faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by external trainer or the faculty concerned. The marks shall be entered on the index sheet of the practical file. Each experiment will be evaluated in 5 marks as per given distribution.

Evaluation scheme:

S. No.	Experiment (10 marks)	Attendance (10 marks)	Test result (20 marks)	Viva (10 MARKS)	Average in 5 Marks
Experiment 1					
Experiment 2					
:					
Experiment 10					

External Evaluation (50 marks)

The external evaluation would also be done by the external trainer or industrial expert or by faculty based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEE792	B. Tech (Electrical)- Semester-VII **Industrial Training & Presentation**	L-0 T-0 P-0 C-2
Course Procedure:		
	Students will have to undergo industrial training of six weeks in any industry or reputed organization after the VI semester examination in summer. The evaluation of this training shall be included in the VII semester evaluation. The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the VI semester and shall be the nodal officer for coordination of the training. Students will prepare an exhaustive technical report of the training during the VII semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college. The student at the end of the VII semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned. Not more than three students would form a group for such industrial training/ project submission.	
	The marking shall be as follows.	
Internal: **50 marks**	By the Faculty Guide – 25 marks. By Committee appointed by the Director/Principal – 25 marks.	
External: **50 marks**	By Officer-in-charge trainee in industry – 25 marks. By External examiner appointed by the University – 25 marks	
	Technical report will consist five chapter as per given format:	
Chapter 1:	Brief about organization	
Chapter 2:	Detail of business carried out by organization	
Chapter 3:	Specific contribution during the industrial training (not more than 500 words)	
Chapter 4:	Learning during the industrial training (not more than 200 words)	
Chapter 5:	Conclusion	

Course Code: EEE798	B. Tech (Electrical)- Semester-VII **Project Work Phase-I**	L-0 T-0 P-10 C-5
Course Procedure:		
	A group of students, not more than three, will be assigned a faculty guide who would be the supervisor of the group. The faculty would be identified in the starting of the VII semester. The group will carry out the literature search and collect required material for carrying out the project. The group will prepare a report not exceeding 15 pages at the end of semester. The assessment of performance of students should be made at least twice in each semester i.e. VII and VIII. In this semester, the student shall present the progress of project live as also using overheads project (30% Project completion) or power point presentation on LCD to the internal committee. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.	
	The marking shall be as follows.	
Internal: 100 marks	By the Faculty Guide - 50 marks By Committee appointed by the Director/Principal – 50 marks	

Course Code: EGP711	B.Tech- Semester-VII **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: EEE713	**Program Elective- III** **B.Tech (Electrical)- Semester-VII** **High Voltage Engineering**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the knowledge of necessity and methods of testing various apparatus in power system.	
CO2.	**Applying** the knowledge of various circuits for generating high voltages for testing various apparatus and their measurement method.	
CO3.	**Analysing** the breakdown phenomenon in gases, liquids and solid insulators.	
CO4.	**Analysing** the knowledge of the various reasons of overvoltage in power system and protection methods against them.	
CO5.	**Evaluating** the knowledge of insulation coordination and design of insulation levels of various parts of power system.	
Course Content:		
Unit-1:	**Conduction and Breakdown of Gaseous Insulation Materials:** Ionization process and current growth; Townsend's criterion for breakdown; Breakdown in electronegative gases; Time lags for breakdown; Paschen's law; Corona discharges; Breakdown in non-uniform fields; Selection of insulating gases.	**8 Hours**
Unit-2:	**Conduction and Breakdown in Liquid and Solid Dielectrics:** Breakdown mechanisms in liquid dielectrics; Liquid dielectrics used in practice; Various processes of breakdown in solid dielectrics; Solid dielectrics; Solid dielectrics used in practice.	**8 Hours**
Unit-3:	**Generation of High Voltages and Currents:** Generation of high DC voltages: Multiplier circuits, Van de Graff generator; High alternating voltage generation using cascade transformers; Production of high frequency AC high voltages; Standard impulse wave shapes; Marx circuit; Generation of switching surges; Impulse current generation; Tripping and control of impulse generators.	**8 Hours**
Unit-4:	**Measurement of High Voltages and Currents:** HVDC measurement techniques; Measurement of power frequency A.C. voltages: Sphere gap measurement technique, Potential divider for impulse voltage measurements; Measurement of high D.C, A.C and impulse currents; Use of CRO for impulse voltage and current measurements.	**8 Hours**
Unit-5:	**High Voltage Testing:** Testing: Insulators, Bushings, Cables, Isolators, Circuit Breakers and Transformers; Surge diverter testing; Radio interference measurement; Use of I.S. for testing.	**8 Hours**
Text Book:	1. C.L.Wadhwa, "High Voltage Engineering", Wiley Eastern Limited.	
Reference Books:	**1**. E. Kuffel. and M. Abdullah, "High Voltage Engineering", Pergamon Press. **2**. Dieter Kind, "An Introduction to High Voltage Experimental Techniques", Wiley Eastern Limited. 3. M.S.Naidu, and V. Kamaraju, "High Voltage Engineering", Tata McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/108/104/108104048/ https://digital-library.theiet.org/content/journals/hve	

Course Code: EEE714	Program Elective III B.Tech (Electrical) Semester-VII **Power Generation Systems**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the electrical power plant operation and control with respect to its economic aspect.	
CO2.	**Applying** gathered knowledge to determine the significance of various components of the power generation plants.	
CO3.	**Analysing** different types of tariff, consumers and different types of power generation plants.	
CO4.	**Evaluating** the importance of interconnected operation of different power generation systems.	
CO5.	**Creating** a Plan for appropriate scheduling of electric power to satisfy the demand constraint.	
Course Content:		
Unit-1:	**Economics of Generation:** Load and load duration curve: Load, Demand and diversity factors, Plant capacity and plant use factors; Choice of type of generation; Choice of size and number of units; Cost of energy generated: Tariffs.	**8 Hours**
Unit-2:	**Hydro power plants:** Layout and working; Types of turbines for high, medium and low head plants; Advantages of hydro generation; Environmental issues; Hydro-Thermal scheduling problem.	**8 Hours**
Unit-3:	**Thermal power plants:** Location, Layout and working of steam and diesel power plants; Types of boilers and turbines and other accessories for steam and gas power plants; Environmental issues.	**8 Hours**
Unit-4:	**Nuclear power plants:** Principles of nuclear power generation; Types of nuclear power plants and their comparative study; Layout and working of nuclear power plants; Advantages and disadvantages of nuclear energy; Reactor control; Reactor safety; Environmental issues.	**8 Hours**
Unit-5:	**Non-conventional power plants (Explanation of Power Generation through Block Diagrams):** Basic concepts; Principle of working and layout of MHD; Solar; Wind; Tidal; Biomass and Geothermal Power Generating Systems.	**8 Hours**
Text Book:	**1.** M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons, Delhi.	
Reference Books:	**1.** I. J. Nagrath and D.P. Kothari, "Modern Power System Analysis", Tata Mc Graw Hill. **2.** C. L. Wadhwa, "Generation, Distribution and Utilization of Electric Energy", New Age **3.** International Ltd. **4.** M.V. Deshpande, "Elements of Electrical Power Station design", Pitman, New Delhi. **5.** S.L. Uppal, "Electrical Power", Khanna Publishers, New Delhi. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/108/102/108102047/ http://journals.elsevier.com/international-journal-of-electrical-power-and-energy-systems/	

Course Code: EEE720	**Program Elective III** **B.Tech (Electrical) Semester-VII** **Electric Vehicle**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** working of Electric Vehicles and recent trends.	
CO2.	**Applying** knowledge to develop the electric propulsion unit and its control for application of electric vehicles.	
CO3.	**Analyzing** different power converter topology used for electric vehicle application.	
CO4.	**Evaluating** different configurations of electric vehicles and its components	
CO5.	**Creating** an understating for different energy storage technologies used for hybrid electric vehicles and their control.	
Course Content:		
Unit-1:	**Introduction to Electric Vehicle**: History, Component of Electric Vehicle, Technological Comparison with Internal Combustion Engine, Benefits and challenges in comparison with IC Engine, EV classification and their electrification level, EV Terminology, Policies and Regulation in Indian and Global Scenario.	**8 Hours**
Unit-2:	**Conventional Vehicle:** Basics of vehicle performance, vehicle power source characterization, transmission characteristics, Mathematical models to describe vehicle performance.	**8 Hours**
Unit-3:	**Hybrid Electric Drive Trains:** Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.	**8 Hours**
Unit-4:	**Electric Drive Trains :** Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. **Electric Propulsion Unit:** Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.	**8 Hours**
Unit-5:	**Sizing the drive system:** Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems.	**8 Hours**
Text Books:	**1.** Electric Vehicle Machines and Drives: Design, Analysis and Application (Wiley - IEEE) by K.T. Chau, Wiley Publication.	
Reference Books:	**1.** Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives (Automotive Series) by Chris Mi, M.Abul Masroor: Wiley Publication **2.** Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, Second Edition (Power Electronics and Applications Series) by Mehrdad Ehsani, Yimin Gao & Ali Emadi: CRC Press Publication. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	• https://www.inderscience.com/jhome.php?jcode=ijehv • https://nptel.ac.in/courses/108/102/108102121/	

Course Code: EHM 731	Program Elective- IV B.Tech - Semester-VII **Principle of Management**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the concept, evolution and current trends of management.	
CO2.	**Applying** managerial functions like planning, organizing, staffing, leading & controlling in decision making.	
CO3.	**Applying** theories of motivation and leadership in organizational settings.	
CO4.	**Analyzing** techniques and methods of HR planning, recruitment, selection, training and development, performance management.	
CO5.	**Evaluating** controlling techniques- budgetary and non-budgetary, and productivity problems in management.	
Course Content:		
Unit-1:	**Introduction To Management And Organizations** Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.	**8 Hours**
Unit-2:	**Planning** Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques –Decision making steps and process.	**8 Hours**
Unit-3:	**Organising:** Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.	**8 Hours**
Unit-4	**Directing** Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.	**8 Hours**
Unit-5	**Controlling:** System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.	**8 Hours**
Text Book:	**1.** Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd.	
Reference Books:	**1.** Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education. **2.** Robert Kreitner & Mamata Mohapatra, "Management", Biztantra. **3.** Harold Koontz & Heinz Weihrich "Essentials of Management" Tata McGraw Hill. **4.** Tripathy PC & Reddyu Pn," Principles of Management", Tata McGraw Hill. **5.** JAF Stoner, Freeman R.E and Daniel R Gilbert "Management: Pearson Education. ***Latest editions of all the suggested books are recommended.**	

Additional electronic reference material	https://www.youtube.com/watch?v=lj7ZnyskZuA&list=PLesgViD0jhW-Ydpei3GnpoUwUGbLg50-G https://www.youtube.com/watch?v=knjXleVohpg	

Course Code: EHM735	**Program Elective- IV** **B.Tech - Semester-VII** **Industrial Sociology**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the concepts of sociology, trace its historical development, and social impact of industrialization.	
CO2.	**Understanding** the nature of modern societies, significance of the current service sector, and importance of work experience in Industry	
CO3.	**Understanding** the concepts related the industrial work.	
CO4.	**Analyzing** the problems of business Ethics.	
CO5.	**Creating** corporate culture, reputation and ethical leadership in organizational settings.	
Course Content:		
Unit-1:	**Sociology in the industrial Perspective:** Concept of Sociology, Sociology as a Science, Sociology of work & industry, Perspectives for sociological analysis of work, Class- Conflict in Industry, Social impact of industrialization, Corporate skills in the fast growing multinational set up.	**8 Hours**
Unit-2:	**Work and Social change:** Nature of modern societies, emergence of industrial capitalism, Technology & Social change, the information society after the industrial society, post-modernity, globalization & Convergence, Significance of the service sector today, work restructuring and corporate management.	**8 Hours**
Unit-3:	**Work experience in Industry:** The concept of alienation, Work satisfaction, Technology & work experience, and Social background of workers, Work orientations, Stress & anxiety of the worker, Work & Leisure, Unemployment, Conflicts in the work place.	**8 Hours**
Unit-4	**General and Applied Ethics**- Ethics and the professions – Standard of right and wrong, problems of Ethical Certainty, Significance of professional Ethics for Engineers, New Technology and Ethics, Applied Ethics - Cases in professional Engineering Practice, Principles of business ethics, Individual in the organization.	**8 Hours**
Unit-5	**Ethical Leadership:** Decision making, corporate culture and reputation management, corporate social responsibility and social reporting.	**8 Hours**
Text Book:	**1.** Sheth N.R., Social Frame Work of Indian Factory, O.U.P. Bombay.	
Reference Books:	1. Fleddermann Charles, Engineering Ethics, Upper Saddle River- N.J. Prentice Hall. 2. Miller & Form, Industrial Sociology, London Harper & Row. 3. Parsons Richard D., The Ethics of Professional Practice- Allyn& Bacon, London. 4. Govinda rajan- Engineering Ethics- Prentice Hall (India) New Delhi. **5.** Gisbert P., Fundamentals of Industrial Sociology, O.U.P. New Delhi. **6.** Watson Tony J., Sociology: Work & Industry, New York. Routledge. 7. Schinzinger, Roland & Mike W. Martin, Introduction to Engineering Ethics- Boston, McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/109/104/109104074/ https://nptel.ac.in/content/storage2/courses/109103023/download/Lecture%201.pdf	

Course Code: EHM 733	Program Elective- IV B.Tech - Semester-VII **Organizational Behaviour**	L-3 T-1 P-0 C-4
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the concept, nature, characteristics and models of organizational behaviour.	
CO2.	**Understanding** the process of perception, theories of personality shaping, and theories of learning.	
CO3.	**Applying** the theories of motivation for motivating the workforce.	
CO4.	**Analyzing** different leadership styles and theories.	
CO5.	**Evaluating** strategies of emotional intelligence, resistance to change, conflict management, and stress management.	
Course Content:		
Unit-1:	Concept, Nature, Characteristics, Models of Organizational Behaviour, Management Challenge, Organizational Goal.Global challenges and Impact of culture.	**8 Hours**
Unit-2:	**Perception:** Concept, Nature, Process, Importance. Attitudes and Workforce Diversity. **Personality:** Concept, Nature, Types and Theories of Personality Shaping, Learning: Concept and Theories of Learning.	**8 Hours**
Unit-3:	**Motivation:** Concepts and Their Application, Principles, Theories, Motivating a Diverse Workforce. **Leadership:** Concept, Function, Style and Theories of Leadership-Trait, Behavioural and Situational Theories. Analysis of Interpersonal Relationship.	**8 Hours**
Unit-4	**Organizational Power and Politics:** Concept, Sources of Power, Approaches to Power, Political Implications of Power. Knowledge Management & Emotional Intelligence in Contemporary Business Organization. **Organizational Change:** Concept, Nature, Resistance to change, Managing resistance to change, Implementing Change.	**8 Hours**
Unit-5	**Conflict:** Concept, Sources, Types, Functionality and Dysfunctional of Conflict, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organizational, Resolution of Conflict, Stress: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress.	**8 Hours**
Text Book:	**1.** Dwivedi, D. N, Managerial Economics, Vikas Publishing House.	
Reference Books:	**1.** Robbins Stephen P., Organizational Behavior Pearson Education **2.** Hersey Paul, "Management of Organizational Behavior: Leading Human Resources" Blanchard, Kenneth H and Johnson Dewey E., Pearson Education **3.** Khanka S. S. "Organizational Behavior. **4.** Varshney & Maheshwari, Managerial Economics, Sultan Chand & Sons. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/110/105/110105033/ http://www.digimat.in/nptel/courses/video/110105033/L34.html	

Course Code: EHM 734	**Program Elective- IV** **B.Tech - Semester-VII** **Engineering and Managerial Economics**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Understanding** the role of managerial economics in engineering perspective.	
CO2.	**Understanding** different market structures and price determination in different market conditions.	
CO3.	**Understanding** the concepts of national income, inflation, and business cycles.	
CO4.	**Applying** the concepts of demand analysis.	
CO5.	**Evaluating** fixed cost, variable cost, average cost, marginal cost, Opportunity cost.	
Course Content:		
Unit-1:	**Introduction:** Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology; Managerial Economics and its scope in engineering perspective.	**8 Hours**
Unit-2:	**Demand:** Basic Concepts Demand Analysis; Law of Demand; Determinates of Demand; Elasticity of Demand-Price, Income and cross Elasticity; Uses of concept of elasticity of demand in managerial decisions.	**8 Hours**
Unit-3:	**Forecasting:** Demand forecasting; Meaning, significance and methods of demand forecasting; production function; Laws of returns to scale & Law of Diminishing returns scale. **Short and Long run Cost curves:** fixed cost, variable cost, average cost, marginal cost, Opportunity cost.	**8 Hours**
Unit-4	**Market Study:** Market Structure Perfect Competition; Imperfect competition: Monopolistic competition, Monopoly, Oligopoly, Duopoly Sorbent features of price determination and various market conditions.	**8 Hours**
Unit-5	**Inflation:** National Income; Concept of N.I. and Measurement; Inflation: Meaning of Inflation; Type, causes& prevention methods; Business Cycles, Phases of business cycle.	**8 Hours**
Text Book:	**1.** Kakkar, D.N., Managerial Economics for Engineering, New Age International Publication.	
Reference Books:	**1.** Dwivedi, D.N., Managerial Economics, Vikas Publishing. **2.** Maheshwari, Y., Managerial Economics, Prentice Hall of India. **3.** Koutsoyiannis, A : Modern Microeconomics, ELBS. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/110/101/110101005/ https://www.youtube.com/watch?v=RaXQ8wQ6TUs	

Course Code: EEE811	B.Tech (Electrical)- Semester-VIII **Electric Power System Operation**	L-3 T-0 P-0 C-3
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of Load flow in interconnected power system and role of SCADA for complex power system.	
CO2.	**Applying** the concept of power system optimization and optimal power flow condition.	
CO3.	**Analysing** the concept of Load frequency control in power system.	
CO4.	**Evaluating** the concept of voltage control by Reactive power compensation.	
CO5.	**Creating** mathematical models of power system for dynamic studies.	
Course Content:		
Unit-1:	**Introduction:** Structure of power systems; Power system control center and real-time computer control; SCADA system; Level decomposition in power system; Power system security; Various operational stages of power system; Power system voltage stability.	**8 Hours**
Unit-2:	**Economic Operation:** Concept and problems of unit commitment; Input-output characteristics of thermal and hydroplanes, System constraints; Optimal operation of thermal units without and with transmission losses: Penalty factor, Incremental transmission loss, Transmission loss formula (without derivation); Hydrothermal scheduling: Long and short terms; Concept of optimal power flow.	**8 Hours**
Unit-3:	**Load Frequency Control:** Concept of load frequency control: Load frequency control of single area system; Turbine speed governing system and modeling; Block diagram representation of single area system: Steady state analysis, Dynamic response, Control area concept, P-I control; Load frequency control and Economic dispatch control: Load frequency control of two area system, Tie line power modeling, Block diagram representation of two area system, Static and dynamic response.	**8 Hours**
Unit-4:	**Automatic Voltage Control:** Schematic diagram and block diagram representation, different types of Excitation systems & their control. **Voltage and Reactive Power control: V**oltage control: Methods of voltage control, Control by tap changing transformer; Compensation: Shunt compensation, Series compensation, Phase angle compensation.	**8 Hours**
Unit-5:	**Computer Control of Power System:** Energy control center; Various levels: National, Regional and State level; SCADA system: Computer configuration, Monitoring, Data acquisition and controls; **EMS System-** System operating states: Normal, Alert, Emergency, In-extremis, Restorative-Control strategies.	**8 Hours**
Text Book:	1. D.P. Kothari & I. J. Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill.	
Reference Books:	1. O. I Elgerd. "Electric Energy System Theory", Tata McGraw Hill. 2. P. Kundur, "Power System Stability and Control", McGraw Hill. 3. M.H. Rashid "Power Electronics: Circuits, Devices and Applications", Prentice Hall of India. 4. A. J. Wood & B.F. Wollenburg, "Power Generation, Operation and Control", John Wiley & Sons. 5. P.S.R., Murty, "Operation and control in Power Systems", B.S. Publications. 6. N. G. Hingorani & L. Gyugyi, "Understanding Facts Concepts and Technology of Flexible AC Transmission Systems", Wiley India. *** Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	• https://nptel.ac.in/courses/108/101/108101040/ • http://pcmp.springeropen.com	

Course Code: EEE898	B. Tech (Electrical)- Semester-VIII **Project Work Phase-II**	L-0 T-0 P-6 C-3
Course Procedure:		
	Students should devote themselves to prepare something tangible, which could be a working model of their thoughts based on their subject of choice. The project shall be finalized by the students based on the VII semester project work report and shall be completed (100% working condition) and submitted at least one month before the last teaching day of the VIII semester, date of which shall be notified in the academic calendar. The assessment of performance of students should be made at least twice in each semester i.e. VII and VIII. In this semester student shall present the final project live as also using overheads project or power point presentation on LCD to the internal committee as also the external examiner. The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.	
	The marking shall be as follows.	
Internal: 50 marks	By the Faculty Guide - 25 marks By Committee appointed by the Director/Principal – 25 marks	
External: 50 marks	By External examiner appointed by the University – 50 marks.	

Course Code: EGP811	B.Tech- Semester-VIII **Discipline & General Proficiency**	L-0 T-0 P-0 C-0

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.

2. Participation in Conferences /Workshops / Seminars.

3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

4. Participation in community projects including NSS.

5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

8. General behavior

9. Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

S No		Enroll No.	Student Name	Dress code	Participation in Conferences /Workshops / Seminars	Participation in guest lectures, invited talks and special technical sessions	Participation in community Services	Participation in Culture & extra curriculum activities, Department Club Activities	Participation in sports/ co-curricular activities	General Behavior	Any Extra Achievement
				(5)	**(15)**	**(20)**	**(10)**	**(20)**	**(20)**	**(5)**	**(5)**
	Responsible for marks			Mentor	Head	Head	Mentor	Cultural Events Coordinator & Department Club Coordinator	Sports Coordinator	Mentor	Director or Principal

Course Code: EEE812	**Program Elective V** **Semester-VIII** **FACTS Technology**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concept of semi-conductor devices and its application as FACTS Controllers.	
CO2.	**Applying** gathered knowledge & select the controllers for different Contingencies.	
CO3.	**Analysing** real network problems with FACTS controllers.	
CO4.	**Evaluating** the control of power system parameters effectively and appropriately using FACTS Controllers	
CO5.	**Creating** an understanding the recent trend in FACTS controllers and coordination of FACTS controllers.	
Course Content:		
Unit-1:	**Introduction to FACTS:** Electrical Transmission Network: Necessity, Power flow in AC system; Relative importance of controllable parameter; Opportunities for FACTS: Possible benefits for FACTS, Power Semiconductor Devices, Perspective on Power Devices, Types of High-Power Devices, Principal High-Power Device Characteristics and Requirements: Voltage and Current Ratings, Losses and Speed of Switching, Parameter Trade-Off of Devices; Power Device Material, Diode (PN Junction)Transistor, MOSFET, Thyristor (without Turn-Off Capability), Gate Turn-Off Thyristor (GTO), Turn-On and Turn-Off Process, MOS Turn-Off Thyristor (MTO), Insulated Gate Bipolar Transistor (IGBT), MOS-Controlled Thyristor (MCT).	**8 Hours**
Unit-2:	**Static VAR Compensation:** Need for compensation: Shunt & series compensation, Objectives of shunt & series compensation, Configuration & operating characteristics; Thyristor controlled reactor (TCR); Thyristor Switched Capacitor (TSC); Comparison of TCR & TSC.	**8 Hours**
Unit-3:	**Voltage-Sourced Converters:** Basic Concept of Voltage-Sourced Converters, Single-Phase Full-Wave Bridge Converter Operation, Single Phase-Leg Operation, Square-Wave Voltage Harmonics for a Single-Phase Bridge, Three-Phase Full-Wave Bridge Converter, Converter Operation, Fundamental and Harmonics for a Three-Phase Bridge Converter, Sequence of Valve Conduction Process in Each Phase-Leg, Transformer Connections for 12-Pulse Operation, Three-Level Voltage-Sourced Converter, Operation of Three-Level Converter, Fundamental and Harmonic Voltages for a Three-Level Converter, Three-Level Converter with Parallel Legs, Pulse-Width Modulation (PWM) Converter**.**	**8 Hours**
Unit-4:	**Series Compensation:** Variable impedance type series compensation; Thyristor switched series capacitor (TSSC); Thyristor controlled series capacitor (TCSC); Basic operating control schemes for TSSC & TCSC. **Static Voltage Phase Angle Regulator:** Objectives of voltage & phase angle regulators: approaches to Thyristor, Controlled Voltage & Phase Angle Regulator.	**8 Hours**
Unit-5:	**Emerging FACTS Controller:** STATCOM; Unified Power Flow Controller (UPFC); Interline Power Flow Controller (IPFC); Basic operating principles of UPFC; Sub-synchronous resonance.	**8 Hours**
Text Book:	**1.** Narain G. Hingorani & Laszlo Gyugyi, "Understanding FACTS – Concepts & Technology offlexible AC Transmission Systems", Standard Publishers, New Delhi.	
Reference Books:	**1.** T. J. E Miller., "Reactive Power Control in Electric System", John Wiley & Sons. **2.** G.K Dubey., "Thyristorized Power Controller", New Age international (P) Ltd., New Delhi.	

	3. Mohan Mathur, R. & Rajiv K. Varma, "Thyristor Based FACTS Controller for Electrical Transmission Systems", Wiley Inter science Publications. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	• https://nptel.ac.in/courses/108/107/108107114/ • https://www.tandfonline.com/doi/abs/10.1080/07313569708955725	

Course Code: EEC814	**Program Elective- V** **B.Tech (Electrical)- Semester-VIII** **Electronic Circuits**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** the concepts for the designing of the Amplifiers and Oscillators.	
CO2.	**Applying** the functioning of operational amplifiers and its applications in details.	
CO3.	**Analysing** the functioning of 555 Timer & 565 PLL Circuits (Block Diagram, Characteristics and Applications).	
CO4.	**Analysing** of the different types electronic circuits.	
CO5.	**Evaluating** the concept and applications of Integrated Circuits.	
Course Content:		
Unit-1:	**Amplifiers and Oscillators:** Class A, B, AB and C amplifiers and respective Q-Points, Push-Pull and Darlington amplifier. Voltage and Current feedback systems, Positive and Negative feedback systems, Wein bridge oscillator, RC-phase shift oscillator; Hartley and Colpitts oscillators; Crystal oscillators	**8 Hours**
Unit-2:	**Characteristics of Op-Amp:** Ideal OP-AMP characteristics: DC characteristics, AC characteristics; Offset voltage and current; Differential amplifier; Frequency response of OP-AMP.	**8 Hours**
Unit-3:	**Applications of OPAMP:** Basic applications of op-amp: Summer, Differentiator and Integrator. Low Pass and High Pass Filters; V/I & I/V converters; Comparators; Multivibrator; Peak detectors, S/H circuits, D/A and A/D converters, Successive Approximation.	**8 Hours**
Unit-4:	**Special ICs:** 555 Timer circuit; Functional block; Characteristics & applications; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.	**6 Hours**
Unit-5:	**Application ICs:** IC voltage regulators: 78XX, 79XX Series, LM317, 723 regulators, SMPS, LM 380 power amplifier.	**8 Hours**
Text Books:	**1.** J. Millman, C. C. Halkias, and Satyabratha Jit, Electronic Devices and Circuits, Tata McGraw Hill.	
Reference Books:	**1.** T.F. Bogart Jr., J. S. Beasley and G. Rico, Electronic Devices and Circuits, Pearson Education. **2.** S. G. Burns and P. R . Bond, Principles of Electronic Circuits, Galgotia Publications. **3.** Millman and Grabel, Microelectronics, Tata McGraw Hill. **4.** Jacob Millman, Christos C. Halkias, "Integrated Electronics - Analog and Digital circuits system", Tata McGraw Hill **5.** Robert F. Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", Pearson Education, PHI. **6.** David A. Bell, "Op-amp & Linear ICs", Prentice Hall of India, 2nd edition. 7. R. L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, Pearson, Prentice Hall. **8.** Ramakant A. Gayakward, "Op-amps and Linear Integrated Circuits", Pearson Education. **9.** D. Roy Choudhary, Sheil B.Jani, "Linear Integrated Circuits", II edition, New Age. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/117/107/117107094/ https://www.youtube.com/watch?v=kiiA6WTCQn0	

Course Code: EEE821	**Program Elective- V** **B.Tech (Electrical)- Semester-VIII** **EHV AC/DC Transmission**	**L-3 T-0 P-0 C-3**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** qualitative comparison of AC and DC transmission system with all aspects.	
CO2.	**Understanding** the need of EHV AC transmission and various issues related with it.	
CO3.	**Applying** Reactive power management, Stability of AC and DC systems.	
CO4.	**Analysing** In depth converter analysis, faults, protections, harmonic considerations, grounding system.	
CO5.	**Evaluating** the Journey from conventional HVDC control to modern HVDC control schemes.	
Course Content:		
Unit-1:	EHV AC TRANSMISSION: Need of EHV transmission lines, power handling capacity and surge impedance loading. Problems of EHV transmission, bundled conductors geometric mean radius of bundle, properties of bundle conductors. Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise.	**8 Hours**
Unit-2:	LOAD FREQUENCY CONTROL: Introduction to control of active and reactive power flow, trubin speed governing system. Speed governing characteristic of generating unit and parllel operation of generations. Element of load frequency control. Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only)	**8 Hours**
Unit-3:	VOLTAGE CONTROL: No load receiving end voltage and reactive power generation. Methods of voltage control. Synchronous phase modifier, shunt capacitors and reators, saturable reactors, Thynstorised static VAR compensators.	**8 Hours**
Unit-4:	FACTS : Introduction to FACTS controllers	**6 Hours**
Unit-5:	HVDC TRANSMISSION: Types of D.C. links, advantages and disadvantages of HVDC transmission. Basic scheme and equipment of converter station. Ground return. Basic principles of DC link control and basic converter control characteristics. Introduction to multiterminal HVDC systems. Application of HVDC transmission.	**8 Hours**
Text Book	1. R.D. Begamudre-EHV AC Transmission Engineering. New Age International Publishers. ***Latest editions of all the suggested books are recommended.**	
Reference Books:	1. K. R. Padiyar, "HVDC Power Transmission Systems", New Age International Publishers, 2011. 2. J. Arrillaga, "High Voltage Direct Current Transmission", Peter Peregrinus Ltd., 1983. 3. E. W. Kimbark, "Direct Current Transmission", Vol.1, Wiley-Interscience, 1971. 2. B.R. Gupta-Generation of Electrical Engineering. S. Chand Publication.	
Additional electronic reference material	• https://nptel.ac.in/courses/108/108/108108099/ • https://www.mdpi.com/journal/applsci/special_issues/modern_power	

Course Code: EEE831	**Program Elective- VI** **B. Tech (Electrical)- Semester-VIII** **Machine learning & Data Analytics**	**L-3** **T-1** **P-0** **C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** concepts of machine learning and data analytics like bagging and boosting, clustering.	
CO2.	**Understanding** Bayesian learning and Bayesian Network.	
CO3.	**Applying** Kmeans Clustering and Agglomerative Hierarchical Clustering	
CO4.	**Applying** decision trees for problem solving.	
CO5.	**Analysing** a variety of learning algorithms.	
Course Content:		
Unit-1:	Introduction, Different Types of Learning, Hypothesis Space & Inductive Bias, Evaluation and Cross- Validation, Linear Regression, Introduction to Decision Trees, Learning Decision Tree, Over fitting	**8 Hours**
Unit-2:	K- Nearest Neighbour, Feature Selection, Feature Extraction, Collaborative Filtering, Bayesian Learning, Naïve Bayes, Bayesian Network	**8 Hours**
Unit-3:	Logistic Regression, Introduction of Support Vector machine, The Dual Formulation, Maximum Margin with Noise, Nonlinear SVM & Kernel Function, Solution to the Dual Problem.	**8 Hours**
Unit-4:	Multilayer Neural Network, Neural Network and Back propagation Algorithm, Deep Neural Network Introduction to Computational Learning Theory, Sample Complexity: Finite Hypothesis Space, VC Dimension	**8 Hours**
Unit-5:	Introduction to Ensembles, Bagging and Boosting, Introduction to Clustering, Kmeans Clustering, Agglomerative Hierarchical Clustering.	**8 Hours**
Text Books:	**1.** Machine Learning by Tom M. Mitchell, Mc Graw Hill Publication.	
Reference Books:	1.Machine Learning: A Probabilistic Perspective (Adaptive Computation and Machine Learning series) by Kevin P. Murphy, MIT Press. 2.Deep Learning (Adaptive Computation and Machine Learning series) by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press. 3.Introduction to Machine Learning with Python: A Guide for Data Scientists by Andreas Muller ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/110/106/110106072/ https://www.youtube.com/watch?v=YZf5q-ICf8Y	

Course Code: EHM 832	**Program Elective- VI** **B. Tech (Electrical)- Semester-VIII** **Total Quality Management**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be :**	
CO1.	**Understanding** basic and modern concepts of quality and TQM.	
CO2.	**Understanding** importance of human factor in quality	
CO3.	**Understanding** the concept of TPM and six sigma along with the applications.	
CO4.	**Applying** quality control techniques like control charts, 7 QC & 7 New QC tools.	
CO5.	**Analysing** quality related costs.	
Course Content:		
Unit-1:	**Quality Concepts**: Introduction; Meaning; Quality characteristics of goods and services; Evolution of Quality control, TQM; Modern concept, Basic concepts of quality; Dimensions of quality; Juran's quality trilogy; Deming's 14 principles; PDCA cycle; Total quality management (TQM) models.	**8 Hours**
Unit-2:	**Quality Management**: Organizational structure and design; Quality function; Decentralization; Designing and fitting organization for different types products and company; Human Factor in Quality: Attitude of top management; Co-operation of groups; Operators attitude, responsibility; Causes of operators error and corrective methods; Quality circles.	**8 Hours**
Unit-3:	**Quality improvement and cost reduction**: 7 QC tools and new QC tools; Economics of quality value and contribution; Quality cost; Optimizing quality cost; Quality assurance.	**8 Hours**
Unit-4:	**Control Charts**: Theory of control charts; Control charts construction: Construction of Mean & Range charts, fraction defective chart and number of defective charts; Attributes control charts: Defects, construction and analysis of c-chart.	**8 Hours**
Unit-5:	**IS0-9000, Six sigma and TPM**: ISO 9000 series; Concept of Six Sigma and its application; Total Productive Maintenance (TPM).	**8 Hours**
Text Book:	1. Sharma D. D Total Quality Management, S. Chand.	
Reference Books:	1. Menon, H.G., TQM in New Product Manufacturing, McGraw Hill. 2. LaI H., Total Quality Management, Wiley Eastern Limited. 3. Greg Bounds, Beyond Total Quality Management, McGraw Hill. ***Latest editions of all the suggested books are recommended.**	
Additional electronic reference material	https://nptel.ac.in/courses/110/104/110104080/ https://www.youtube.com/watch?v=YKwcxjUnots	

Course Code: EHM 833	**Program Elective- VI** **B. Tech (Electrical)- Semester-VIII** **Entrepreneurship**	**L-3 T-1 P-0 C-4**
Course Outcomes:	**On completion of the course, the students will be:**	
CO1.	**Understanding** the concepts and skills needed to run a business successfully.	
CO2.	**Applying** the steps of project formulation and market research.	
CO3.	**Analyzing** the techno economic feasibility of a project.	
CO4.	**Analyzing** various growth strategies in small scale industry.	
CO5.	**Evaluating** breakeven point, working capital requirements, and taxes.	
Course Content:		
Unit-1:	**Entrepreneurship:** Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.	**8 Hours**
Unit-2:	**Motivation:** Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.	**8 Hours**
Unit-3:	**Business:** Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.	**8 Hours**
Unit-4:	**Financing and Accounting:** Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	**8 Hours**
Unit-5:	**Support to Entrepreneurs:** Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures – Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.	**8 Hours**
Text Book:	**1.** Khanka. S.S., "Entrepreneurial Development" S. Chand & Co. Ltd., Ram Nagar, New Delhi.	
Reference Books:	**1.** Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill. **2.** Mathew J Manimala, "Entrepreneurship theory at cross roads: paradigms and praxis" 2nd Edition Dream tech. **3.** Rajeev Roy, 'Entrepreneurship', Oxford University Press. **4.** Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", Cengage Learning. ***Latest editions of all the suggested books are recommended.**	

Additional electronic reference material	https://nptel.ac.in/courses/110/106/110106141/ https://onlinecourses.nptel.ac.in/noc20_mg35/preview	

Evaluation Scheme:

Internal Evaluation	External Evaluation	Total Marks
40 Marks	**60 Marks**	**100**
The Internal evaluation will be performed by the internal faculty on the basis of the below mentioned parameters: • Problem Identification • Data Collection and Data Analysis • Case study • Proposal of innovative Business idea	External evaluation will be performed by the external examiner on the basis of following parameters: • Report • Presentation • VIVA	

Course Code: EEE861	Program Elective (Lab) - VII B.Tech (Electrical)- Semester-VIII **Power System Simulation (Lab)**	L-0 T-0 P-2 C-1
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** the various power system simulation commands	
CO2.	**Analysing** the load power flow by NR and Gauss Elimination method.	
CO3.	**Analysing** the symmetrical and Unsymmetrical faults using MATLAB.	
CO4.	**Creating** the concept of load frequency control in various areas using MATLAB	
CO5.	**Creating** the model to control voltage level in a power system using MATLAB.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	To study the various power system simulation commands.	
Experiment-2:	To perform load power flow analysis by NR method.	
Experiment-3:	To perform load power flow analysis by fast decoupled NR method.	
Experiment-4:	To perform load power flow analysis by Gauss elimination method.	
Experiment-5:	To study the symmetrical fault analysis.	
Experiment-6:	To study the L-L fault analysis.	
Experiment-7:	To study the L-G fault analysis.	
Experiment-8:	To control the voltage level in a power system by automatic voltage regulator.	
Experiment-9:	To control the voltage level in a power system by tape changing transformer.	
Experiment 10:	To control the voltage level in a power system by tab changing transformer.	
Experiment-11:	To study the load frequency control in single area system.	
Experiment-12:	To study the load frequency control in two area system.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)

Course Code: EEC864	Program Elective (Lab) - VII B.Tech.- Semester-VIII **Electronic Circuits (Lab)**	L-0 T-0 P-4 C-2
Course Outcomes:	**On completion of the course, students will be:**	
CO1.	**Applying** relevant information to supplement to the Electronic Circuit EC (EEC864) course.	
CO2.	**Analysing** and verifying the working of different types of Operational Amplifiers, ICs and the procedure of doing the experiment.	
CO3.	**Creating** the circuits, analyzing the circuits and troubleshoot the designed circuits.	
CO4.	**Creating** and recording the experimental data, analyzing the results, and preparing a formal laboratory report.	
CO5.	**Creating** the circuits with basic semiconductor devices (active & passive elements), measuring instruments & power supplies that serves many practical purposes.	
Experiments:	**Note: Minimum eight experiments should be performed.**	
Experiment-1:	To study the characteristics of Operational Amplifier (IC741).	
Experiment-2:	To generate the waveform using Operational Amplifier (IC741).	
Experiment-3:	To study the Operational Amplifier (IC741) as comparator.	
Experiment-4:	To study the Operational Amplifier (IC741) as differentiator.	
Experiment-5:	To study the Operational Amplifier (IC741) as integrator.	
Experiment-6:	To Implement the S/H circuit using Operational Amplifier (IC741)**.**	
Experiment-7:	To study the DAC (ladder type) and ADC (successive approximation type).	
Experiment-8:	To study applications of Timer IC555 as Multivibrators (monostable and bistable).	
Experiment-9:	To study LM 380 as power amplifier.	
Experiment 10:	To implement the S/H circuit using Operational Amplifier (IC741)**.**	
Experiment-11:	To implement PLL using IC555.	
Experiment-12:	To study the voltage Regulator-IC 723.	

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL INTERNAL (50 MARKS)
EXPERIMENT (5 MARKS)	FILE WORK (10 MARKS)	VIVA (10 MARKS)	ATTENDANCE (10 MARKS)	EXPERIMENT (5 MARKS)	VIVA (10 MARKS)	

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

EXPERIMENT (20 MARKS)	FILE WORK (10 MARKS)	VIVA (20 MARKS)	TOTAL EXTERNAL (50 MARKS)