College Calendar 2021-22

Department of Electrical & Electronics Engineering

Syllabus of 2nd Year
III & IV SEMESTER
Department of
Electrical & Electronics Engineering

College Calendar 2021-22
Do you know in how many ways the ‘Knowledge’ serves his master? Like mother it protects, like father it teaches and guides, like wife, provides all kinds of happiness after destroying all sorrows, it brings wealth from every corner and spreads the fame in all direction. Like ‘Kalpalatha’ knowledge offers everything to human being whatever he wishes.
COLLEGE CALENDAR
2021-22
(III & IV Semester)
Vision Statement

Pursuing Excellence, Empowering people, Partnering in Community Development

Mission Statement

To develop N.M.A.M. Institute of Technology, Nitte, as Centre of Excellence by imparting Quality Education to generate competent, Skilled and Humane Manpower to face emerging Scientific, Technological, Managerial and Social Challenges with Credibility, Integrity, Ethics and Social Concern.
In Memorium

Late Nitte Mahalinga Adyanthaya
Our Founder

Late Justice K. S. Hegde
1909-1990
SRI N. VINAYA HEGDE
President, Nitte Education Trust
Chancellor, Nitte (Deemed to be University), Mangaluru
<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Name of the Faculty</th>
<th>Designation</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Dr. Niranjan N. Chiplunkar</td>
<td>Principal</td>
</tr>
<tr>
<td>2.</td>
<td>Mr. Yogeesh Hegde</td>
<td>Registrar</td>
</tr>
<tr>
<td>3.</td>
<td>Dr. Shrinivasa Rao B. R.</td>
<td>Vice Principal / Controller of Examinations / Professor</td>
</tr>
<tr>
<td>4.</td>
<td>Dr. I. Ramesh Mithanthaya</td>
<td>Vice Principal / Dean (Academics) / Professor</td>
</tr>
<tr>
<td>5.</td>
<td>Dr. Sudesh Bekal</td>
<td>Dean (R&amp;D)/Professor</td>
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<tr>
<td>6.</td>
<td>Dr. Rajesh Shetty K.</td>
<td>Dean (Admissions) / Professor</td>
</tr>
<tr>
<td>7.</td>
<td>Dr. Subrahmanya Bhat K.</td>
<td>Dean (Student Welfare) / Professor</td>
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<td>8.</td>
<td>Dr. Nagesh Prabhu</td>
<td>PG Coordinator/Professor</td>
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<td>9.</td>
<td>Dr. Srinath Shetty K.</td>
<td>Resident Engineer/Professor</td>
</tr>
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<td></td>
<td><strong>HEADS OF DEPARTMENTS</strong></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Prof. Shalini K. Sharma</td>
<td>Counseling, Welfare, Training &amp; Placement</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Arun Kumar Bhat</td>
<td>Civil Engg.</td>
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<tr>
<td>3.</td>
<td>Dr. Jyothi Shetty</td>
<td>Computer Science &amp; Engg.</td>
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<tr>
<td>5.</td>
<td>Dr. Srinivas Pai P.</td>
<td>Mechanical Engg.</td>
</tr>
<tr>
<td>6.</td>
<td>Dr. KV SSSS Sairam</td>
<td>Electronics &amp; Communication Engg.</td>
</tr>
<tr>
<td>7.</td>
<td>Dr. Suryanarayana K.</td>
<td>Electrical &amp; Electronics Engg.</td>
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<tr>
<td>8.</td>
<td>Dr. Ujwal P.</td>
<td>Biotechnology Engg.</td>
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<tr>
<td>10.</td>
<td>Dr. Sharada Uday Shenoy</td>
<td>Artificial Intelligence &amp; Machine Learning Engg.</td>
</tr>
<tr>
<td>12.</td>
<td>Dr. Kumudakshi</td>
<td>Mathematics</td>
</tr>
<tr>
<td>13.</td>
<td>Dr. Shobha R. Prabhu</td>
<td>Physics</td>
</tr>
<tr>
<td>14.</td>
<td>Dr. Shivaprasad Shetty M.</td>
<td>Chemistry</td>
</tr>
<tr>
<td>15.</td>
<td>Mrs. Rashmi D. Hegde</td>
<td>Humanities</td>
</tr>
<tr>
<td>16.</td>
<td>Dr. Surendra Shetty</td>
<td>MCA</td>
</tr>
</tbody>
</table>

**INCHARGE OF INSTITUTION’S RESPONSIBILITIES**

<table>
<thead>
<tr>
<th>Sl.No.</th>
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<tbody>
<tr>
<td>1.</td>
<td>Dr. Gururaj Upadhyaya</td>
<td>Workshop Supdt.</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Narasimha Bailkeri</td>
<td>1st year Coordinator</td>
</tr>
<tr>
<td>3.</td>
<td>Dr. Venkatesh Kamath</td>
<td>Deputy Controller of Examination</td>
</tr>
<tr>
<td>4.</td>
<td>Dr. Janardhan Nayak</td>
<td>Co-ordinator, Red Cross Unit</td>
</tr>
<tr>
<td>5.</td>
<td>Mr. Srinivas Nekkar</td>
<td>NSS Co-ordinator</td>
</tr>
<tr>
<td>6.</td>
<td>Mr. Krishnaraja Joisa</td>
<td>Public Relations Officer</td>
</tr>
</tbody>
</table>
7. Dr. Jnaneshwar Pai Maroor  Co-ordinator, Alumni
8. Sri. Shekar Poojari  Student Welfare Officer
9. Dr. Shivaprasad Shetty M.  NCC Officer

ENTREPRENEURSHIP DEVELOPMENT CELL
1. Dr. Ramakrishna B.  Professor/EDC- Incharge
2. Mrs. Geetha Poojarthi  Co-ordinator

DEPARTMENT OF TRAINING & PLACEMENT
1. Mr. Bharath G. Kumar  Lead Placements

DEPARTMENT OF MATHEMATICS
1. Dr. Shashirekha B. Rai  Professor
2. Dr. P. Shankaran  Professor
3. Dr. Kumudakshi  Asso. Professor/ HoD
4. Dr. Sharad M. Hegde  Asst. Professor Gd III
5. Dr. Vasanth K. R.  Asst. Professor Gd III
6. Mrs. Ambika N.  Asst. Professor Gd I
7. Mrs. Vinaya Acharya  Asst. Professor Gd I
8. Mrs. Anitha D. Bayar  Asst. Professor
9. Mrs. Bhavya K.  Asst. Professor
10. Ms. Chaithra K.  Asst. Professor
12. Mrs. Sharmila  Asst. Professor
13. Mrs. Anjana Pai K.  Asst. Professor
14. Mrs. Soumya  Asst. Professor
15. Mrs. Smitha G. V.  Asst. Professor

DEPARTMENT OF PHYSICS
1. Dr. K. B. Vijaya Kumar  Professor
2. Dr. Sathyajith K. T.  Asso. Professor
3. Dr. Manjunath K. B.  Asso. Professor
4. Dr. Shobha R. Prabhu  Asso. Professor / HoD
5. Dr. Nagaraja B. S.  Asst. Professor Gd III
6. Dr. Raghavendra Bairy  Asst. Professor Gd III
7. Dr. Shyam Prasad K.  Asst. Professor Gd III
DEPARTMENT OF CHEMISTRY
1. Dr. Janardhana Nayak  Professor
2. Dr. Ramesh Bhat  Asso. Professor
3. Dr. Shivaprasad Shetty M.  Asst. Professor Gd III/HoD
4. Dr. Aarti S. Bhat  Asst. Professor Gd III
5. Dr. Subrahmanya Ishwar Bhat  Asst. Professor Gd III
6. Mr. Sarvajith M. S.  Asst. Professor

DEPARTMENT OF HUMANITIES
1. Dr. Ramakrishna B.  Professor
2. Mrs. Rashmi D. Hegde  Asso. Professor/HoD
3. Dr. Vishwanatha  Asso. Professor
4. Dr. Jnaneshwar Pai Maroor  Asst. Professor Gd III
5. Dr. Joy Elvine Martis  Asst. Professor Gd III
6. Mrs. Shyla D. Mendonca  Asst. Professor Gd II
7. Ms. Sonia Lobo  Asst. Professor Gd I
8. Mr. Srinivas Nekkar  Asst. Professor
9. Mrs. Sudeeksha S. Pai  Asst. Professor

OFFICE SECTION HEADS
1. Mr. Keshava Mugeraya  Sr. Supdt., Academic Section/Purchase In-Charge
2. Mrs. Suneeatha R. Shetty  Sr. Supdt., Administrative Section
3. Mr. Suresh Achar  Sr. Supdt., Stores
4. Mrs. Jayashree  Sr. Programmer
5. Mrs. Shailaja V. Shetty  Supdt., Accounts Section
6. Sri. Sudhakar K.  Incharge Librarian

SECURITY DEPARTMENT
1. Mr. Hirianna Suvarna S.  Security Supervisor

SPORTS DEPARTMENT
1. Sri. Shyam Sundar M.  P.E.D
2. Sri. Ganesh Poojary  P.E.D
3. Ms. Sowjanya M.  P.E.I
4. Mr. Ravi Prakash C. Anpur  Basket Ball Coach
HOSTEL WARDENS

1. Dr. Veena Devi S.V
   Chief Warden, NET Ladies Hostels, Nitte
2. Dr. Vishwanatha
   Chief Warden, NET Gents Hostels, Nitte

HOSTEL SUPERINTENDENT / MANAGER

1. Mr. John D’Souza
   Sr. Manager, Gents Main Hostel
2. Mr. Francis D’Souza
   Hostel Manager, Gents Main Hostel
3. Mr. Rajesh Ballal
   Supervisor, Gents PG Hostel
4. Mrs. Gayathri Kamath
   Supdt. Ladies PG Hostel
5. Mrs. Chethana Sharma
   Supdt.Ladies Main Hostel
6. Mrs. Hema S. Hegde
   Supdt., Hostel Office
REGULATIONS
2021-22
(Applicable for admission batch 2018-19 onwards)

COMMON TO ALL B.E. (CREDIT SYSTEM)
DEGREE PROGRAMMES
REGULATIONS

1. INTRODUCTION
2. DEGREE PROGRAMMES
3. REGISTRATION
4. ADD/DROP/AUDIT OPTIONS
5. COURSE STRUCTURE
6. ATTENDANCE REQUIREMENT
7. WITHDRAWAL FROM THE PROGRAMME
8. EVALUATION SYSTEM
9. EVALUATION OF PERFORMANCE
10. COMMUNICATION OF GRADES
11. VERTICAL PROGRESSION
12. AWARD OF CLASS
13. APPEAL FOR REVIEW OF GRADES
14. AWARD OF DEGREE
15. GRADUATION REQUIREMENTS AND CONVOCATION
16. AWARD OF PRIZES, MEDALS, CLASS AND RANKS
17. CONDUCT AND DISCIPLINE
18. EARNING OF ACTIVITY POINTS FOR THE AWARD OF DEGREE
19. LISTS OF MAJOR SCHOLARSHIPS
1. INTRODUCTION

1.1 The general regulations are common to all B.E. (Credit System) Degree Programmes conducted at the NMAMIT, Nitte Campus and shall be called “NMAMIT Regulations”.

1.2 The provisions contained in this set of regulations govern the policies and procedures on the Registration of students, imparting Instructions of course, conduct of the examination and evaluation and certification of student's performance and all amendments related to the said Degree programme(s).

1.3 This set of Regulations, on approval by the Academic Council and Governing Council, shall supersede all the corresponding earlier sets of regulations of the BE Degree program (of VTU) along with all the amendments thereto, and shall be binding on all students undergoing the Graduate Degree Programme(s) (Credit System) conducted at the NMAMIT, Nitte with effect from its date of approval. This set of Regulations, may evolve and get modified or changed through appropriate approvals from the Academic Council / Governing Council from time to time, and shall be binding on all stake holders (The Students, Faculty, Staff of Departments of NMAMIT, Nitte). The decision of the Academic Council/ Governing Council shall be final and binding.

1.4 In order to guarantee fairness and justice to the parties concerned in view of the periodic evolutionary refinements, any specific issues or matters of concern shall be addressed separately, by the appropriate authorities, as and when found necessary.

1.5 The Academic Council may consider any issues or matters of Concern relating to any or all the academic activities of NMAMIT courses for appropriate action, irrespective of whether a reference is made here in this set of Regulations or otherwise.

1.6 The course shall be called Bachelor of Engineering course abbreviated as B.E. (Subject of specialization) – Credit System.

1.7 DURATION OF THE COURSE

(a) The course shall extend over a period of total duration of 4 years.

(b) Each year shall have the following schedule with 5 ½ days a week.

Suggested Break down of Academic Year into Semesters
1. **No. of Semesters / Year Three; Two being Main semesters (odd, even) and one being a supplementary semester; after 2 main semesters.**

   (Note: Supplementary semester is primarily to assist weak and/ or failed students through make up courses. However, Autonomous Colleges may use this semester to arrange Add-On courses for other students and/ or for deputing them for practical training elsewhere.)

2. **Semester Duration**

   | Main semester (odd, even) each 19 Weeks; | Supplementary Semester 8 Weeks |

3. **Academic Activities**

   | Main Semester |

   | (Weeks): | Registration of Courses & Course Work (16.0) |
   | | Examination Preparation and Examination (3.0) |
   | | Total (19) |
   | Supplementary Semester |
   | Registration of Courses & Course Work (5.0) |
   | Examination Preparation and Examination (3.0) |
   | Total (8) |
   | Declaration of results: 2 weeks from the date of last examination |
   | Inter- Semester Recess: |
   | After each Main Semester (2) |
   | Total Vacation: 10 weeks (for those who do not register for supplementary semester) and 4 weeks (for those who register for supplementary semester) |

(Note: In each semester, there will be provision for students for Registration of courses at the beginning, dropping of courses in the middle and withdrawal from courses towards the end, under the advice of faculty member. These facilities are expected to enhance the learning capabilities of students, minimizing their chances of failure in courses registered and also ensure their better monitoring by Faculty Advisors).

A candidate shall be allowed a **maximum duration of eight years from the first semester of admission to become eligible for the award of Bachelor Degree**.

The calendar of events in respect of the course shall be fixed by the Senate from time to time, but preferably in line with the academic calendar of the VTU.
2. DEGREE PROGRAMMES

2.1 Undergraduate B.E. Degree Programmes are offered in the following disciplines by the respective programme hosting departments listed below:

i) Biotechnology Engineering (BT)
ii) Civil Engineering (CV)
iii) Computer Science & Engineering (CS)
iv) Electronics & Communications Engineering (EC)
v) Electrical & Electronics Engineering (EE)
vi) Information Science & Engineering (IS)
vii) Mechanical Engineering (ME)
viii) Artificial Intelligence and Machine Learning Engg. (AM)*
ix) Computer and communication Engineering (CC)*
x) Robotics and Artificial Intelligence Engineering (RA)*

Other teaching departments are –

i) Mathematics (MA)
ii) Physics (PH)
iii) Chemistry (CY)
iv) Humanities, Social Sciences and Management (HU)

2.2 The provisions of these Regulations shall be applicable to any new discipline* that may be introduced from time to time and appended to the above list.

3. REGISTRATION

3.1 Every student after consulting his Faculty Advisor in parent department shall register approved courses (core and elective) to earn credits for meeting the requirements of degree program at the commencement of each Semester on the days fixed for such registration and notified in the academic calendar. Students who fail to register on or before the specified date will have to pay a late fee. Such courses together with their grade and credits earned will be included in the grade card issued by the college at the end of each semester, like odd, even, supplementary and it forms the basis for determining the student’s performance in that semester.

3.2 Lower and Upper Limits for Course Credits Registered in a Semester Course Credit Assignment

All courses comprise of specific Lecture/Tutorial/Practical (L-T-P) schedule. The course credits are fixed based on the following norms.

Lecture / Tutorials / Practical:

i) One hour Lecture per week is assigned one Credit.

ii) 2-hour Tutorial session per week is assigned 1.0 Credit.
iii) 2-hour Lab. session per week is assigned 1.0 credit. For example, a theory course with L-T-P schedule of 3-2-0 hours will be assigned 4.0 credits.

A laboratory practical course with L-T-P schedule of 0-0-2 hours will be assigned 1.0 credit.

Calculation of Contact Hours / Week – A Typical Example

<table>
<thead>
<tr>
<th>No. of Courses</th>
<th>Credits / Course</th>
<th>Total Credits</th>
<th>Contact Hours per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Lecture Courses</td>
<td>3:0:0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>2 Lec. cum Lab Courses</td>
<td>3:0:1</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>2 Lec. cum Tut. Courses</td>
<td>3:1:0</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>1 Lec. Tut. cum Lab Courses</td>
<td>1:1:1</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10:2:2</strong></td>
<td><strong>25</strong></td>
<td><strong>31</strong></td>
</tr>
</tbody>
</table>

A student must register, as advised by Faculty Advisor, between a minimum of 16 credits and up to a Maximum of 28 credits.

3.3 **Mandatory Pre-Registration for higher semester**

In order to facilitate proper planning of the academic activities of the Semester, it is necessary for the students to declare their intention to register for courses of higher semesters (3rd and above) at least two weeks before the end of the current semester choosing the courses offered by each department in the next higher semester which is displayed on the Department Notice Board at least 4 weeks prior to the last working day of the semester.

Registration to a higher semester is allowed only if the student fulfills the following conditions -

i) satisfied all the academic requirements to continue with the programme of studies without termination
ii) cleared all Institute, hostel and library dues and fines, if any, of the previous semester
iii) paid all required advance payments of the Institute and the hostel for the current semester
iv) has not been debarred from registering on any specific grounds by the Institute.
4. **ADD / DROP / AUDIT options**

4.1 **Registration of courses**

Each student shall have to register for course work at the beginning of a semester within 2 to 3 days of commencement after discussing with subject teacher and under faculty advice. The permissible course load to be either average credits (=22) or to be within the limits of minimum (=16) and maximum (=28) credits.

4.2 **DROP-option**

During a specified period at the middle of a semester student’s performance in CIE is reviewed by the faculty advisor. Following poor performance by a student he/she can be facilitated to drop identified course(s) (up to the minimum credits specified for the semester). Such course(s) will not be mentioned in the Grade card. Such courses to be re-registered by these students and taken up for study at a later time.

4.3 **Withdrawal from courses**

During a specific period specified towards the end of the semester, student’s performance in CIE is reviewed by the Faculty advisors. Following poor performance by a student in identified course (s) he/she is advised to withdraw from such course(s) (up to the minimum credits specified for the semester) with mention in the Grade card (Grade ‘W’). Such courses to be re-registered by these students and taken up for study at a later time.

4.4 **AUDIT-option**

A student can register for courses for audit only, with a view to supplement his/her knowledge and/or skills. The student’s grades in such course(s) will have to be reflected in the grade card. However, CORE courses shall not be made available for audit. But these shall not be taken into account in determining the student’s academic performance in the semester. “U” grade is awarded to such courses on satisfying the attendance requirements and CIE requirements. The candidate need not appear for SEE in such courses.

5. **COURSE STRUCTURE:**

5.1 **Typical Breakdown for the B.E. Degree Curriculum:**

<table>
<thead>
<tr>
<th>No.</th>
<th>Course Category</th>
<th>Credit Range</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Basic Sciences (BSC)</td>
<td>24-30</td>
</tr>
<tr>
<td>2.</td>
<td>Engineering Sciences (ESC)</td>
<td>15 -20</td>
</tr>
<tr>
<td>3.</td>
<td>Humanities, Social Sciences and Management</td>
<td>7- 10</td>
</tr>
</tbody>
</table>
4. Professional Courses (PCC) – core | 70 - 90

5. Professional Courses (PEC) – elective | 18

6. Open Elective Courses (OE) | 06

7. Project Work (PROJ)
   Seminar on Current Topic | 16 (VI – 2, VII-2, VIII-12) 01

8. Internship | 03

9. Mandatory Learning courses | Non-Credit

Note: Student can register between 16 to 28 credits per semester
Total Credits to be earned : 175

5.2 The Department Undergraduate Committee (DUGC) will discuss and recommend the exact credits offered for the programme for the above components ‘a’ to ‘g’, the semester wise distribution among them, as well as the syllabi of all undergraduate courses offered by the department from time to time before sending the same to the Board of Studies (BOS). The BOS will consider the proposals from the departments and make recommendations to the senate for consideration and approval.

5.3 The earned Credit Requirement for the B.E. Degree is 175.
Degree is awarded by prescribing the total number of credits to be earned, rather than by using the program duration, giving flexibility to student to plan their career.

5.4 Mandatory Learning Courses
These are courses that must be completed by the student at appropriate time or at his convenience. The ‘PP’ grade is awarded for a Pass in the course and ‘NP’ grade is awarded for a Fail in the course. In case ‘NP’ grade is awarded, the student has to re-register for the same course wherein he has no alternative options. However, he/she can opt for other courses if he/she has been provided with multiple options.

The ‘PP’ and ‘NP’ grades do not carry grade points and hence not included in the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) computations. However such non-credit mandatory courses are required to be included in the students’ performance record (transcript) with Pass or Fail (PP or NP).

Courses that come under this category are the following.
Moral and Ethical Values, Communication skills, Entrepreneurship Development Programme, Environmental issues, Constitution of India, Proficiency in a Language etc.
Such courses will not carry any credits for the award of degree, but a pass in
each of such course during the programme shall be a necessary requirement for the student to qualify for degree award.

5.5 PROJECT

i) Project work at 8th semester shall be completed batch wise. The batch shall consist of a maximum of 4 students.

ii) Project viva-voce examination shall be conducted individually.

5.6 ELECTIVES

i) A candidate shall take electives in each semester from groups of electives, commencing from 5th semester.

ii) The minimum number of students to be registered for any Elective offered shall not be less than ten.

iii) A candidate shall opt for his/her choice of electives and register for the same if pre-registration is not done, at the beginning of each of 5th, 6th, 7th and 8th semesters. The candidate is permitted to opt for change of elective within 15 days from the date of commencement of the semester as per the academic calendar of the college.

6. ATTENDANCE REQUIREMENT:

6.1 Each semester is considered as a unit and the candidate has to put in a minimum attendance of 85% in each subject with a provision of condoning 10% of the attendance by Principal for reasons such as medical grounds, participation in University level sports, cultural activities, seminars, workshops and paper presentation.

6.2 The basis for the calculation of the attendance shall be the period of term prescribed by the College by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course (as per CET/COMED-K or Management allotment).

6.3 The students shall be informed about their attendance position in the first week of every month by the College so that the students shall be cautioned to make up the shortage.

6.4 A candidate having shortage of attendance (<75%) in any course(s) registered shall not be allowed to appear for SEE of such course(s). Such students will be awarded ‘N’ grade in these courses.

He/she shall have to repeat those course(s). Such students shall re-register for the same course(s) core or elective, as the case may be when the particular course is offered next either in a main (odd/even) or supplementary semester.

6.5 Attendance in CIE and SEE: Attendance at all examinations both CIE and SEE of each course registered shall be compulsory and there shall not be any provision for re-examinations. Any student against whom any disciplinary action is pending shall not be permitted to attend any SEE in that semester.
7. WITHDRAWAL FROM THE PROGRAMME

7.1 Temporary Withdrawal

a) A student who has been admitted to a degree programme of the college may be permitted once during the course to withdraw temporarily, for a period of one semester, on the grounds of prolonged illness or grave calamity in the family etc., provided –

i) The student applies to the College within 6 weeks of the commencement of the college stating fully the reasons for withdrawal together with supporting documents and endorsement from his parent/guardian.

ii) The College is satisfied about the genuineness of the case and that even by taking into account the expected period of withdrawal, the student has the possibility to complete the programme requirements (175 credits) within the time limits specified by the university.

iii) The student does not have any dues or demands at the College / University including tuition and other fees as well as library material.

iv) A student availing of temporary withdrawal shall be required to pay such fees and/or charges as may be fixed by the college until such time as his/her name appears on the Student’s roll list. The fees/charges once paid shall not be refunded.

v) A student will be entitled to avail the temporary withdrawal facility only once during his/her studentship. However, any other concession for the concerned student shall have to be approved by the academic council.

7.2 Permanent Withdrawal

Any student who withdraws admission before the closing date of admission for the Academic Session is eligible for the refund of the deposits only. Fees once paid will not be refunded on any account.

Once the admission for the year is closed, the following conditions govern withdrawal of admissions.

(a) A student who wants to leave the College for good, will be permitted to do so (and take Transfer Certificate from the College, if needed), only after remitting the Tuition fees as applicable for all the remaining semesters and clearing all other dues if any.

(b) Those students who have received any scholarship, stipend or other forms of assistance from the College shall repay all such amounts.

(c) The decision of the Principal of the College regarding withdrawal of a student is final and binding.
8. **EVALUATION SYSTEM**

8.1 The Academic Performance Evaluation of a student shall be according to a Letter Grading System, based on the Class Performance Distribution.

8.2 The Letter grades S, A, B, C, D, E, F indicate the level of academic achievement, assessed on a decimal (0-10) scale.

8.3 The Letter grade awarded to a student in a course, for which he has registered shall be based on his performance in quizzes, tutorials, assignments etc., as applicable, in addition to two mid-semester examinations and one semester end examination. The distribution of weightage among these components may be as follows.

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Semester End Examination (SEE)</td>
<td>50% (50 marks)</td>
</tr>
<tr>
<td>Continuous Internal Evaluation (CIE)</td>
<td>50% (50 marks)</td>
</tr>
<tr>
<td>i) Quizzes, Tutorials, Assignments, Seminars, mini projects, tutorials etc.</td>
<td>10 marks</td>
</tr>
<tr>
<td>ii) Mid-semester Examination</td>
<td>40 marks</td>
</tr>
</tbody>
</table>

Any variation, other than the above distribution, requires the approval of the pertinent DUGC and Academic Council.

8.4 The letter grade awarded to a student in a 0-0-P (Practical) course, is based on an appropriate continuous evaluation scheme that the course instructor shall evolve, with the approval of the pertinent DUGC and the performance in SEE held on specified period in a semester.

8.5 The course Instructor shall announce in the class and/or display at the Faculty door/website the details of the Evaluation Scheme, including the distribution of the weightage for each of the components and method of conversion from the raw scores to the letter-grades within the first week of the semester in which the course is offered, so that there are no ambiguities in communicating the same to all the students concerned.

8.6 **Passing standards**

<table>
<thead>
<tr>
<th>Evaluation Method</th>
<th>Passing Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessional (CIE)</td>
<td>Score: ≥40% (≥20 marks)</td>
</tr>
<tr>
<td>Terminal (SEE)</td>
<td>Score: ≥40% (≥20 marks)</td>
</tr>
</tbody>
</table>

i) Project work evaluation: The evaluation of CIE of the project work shall be based on the progress of the student in the work assigned by the project supervisor, periodically evaluated by him/her together with a Department committee constituted for this purpose. Seminar presentation, project report and final oral examination conducted by project evaluation committee at the department level shall form the SEE of the project work.
In the case of other requirements, such as, seminar, industrial internship, field work, comprehensive viva voce, if any, the assessment shall be made as laid down by the Academic council.

iii) There shall be no re-examination for any course in the credit system. However, students

- who have abstained from attending CIE or SEE without valid reasons (‘N’ grade), or
- who have failed (‘F’ grade) to meet the minimum passing standards prescribed for CIE and/or SEE, or
- who have been detained for want of attendance, or
- who have withdrawn (‘W’ grade),
- who have dropped any course shall be required to re-register for such course(s) and go through CIE and SEE again and obtain a grade equal to or better than E in each case. While such students should re-register for same course(s) if core, they can re-register for alternative course(s) from among the elective courses, as the case may be. The re-registration shall be possible when the particular course is offered again either in a main (Odd/Even) or a supplementary semester.

8.7 i) Grade point scale for absolute grading

<table>
<thead>
<tr>
<th>Level</th>
<th>Out Standing</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Average</th>
<th>Poor</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade Points</td>
<td>10</td>
<td>09</td>
<td>08</td>
<td>07</td>
<td>06</td>
<td>04</td>
<td>00</td>
</tr>
<tr>
<td>Score (Marks) Range(%)</td>
<td>≥ 90</td>
<td>&lt; 90 - ≥80</td>
<td>&lt; 80- ≥70</td>
<td>&lt; 70- ≥60</td>
<td>&lt; 60 - ≥50</td>
<td>&lt; 50 - ≥40</td>
<td>&lt; 40</td>
</tr>
</tbody>
</table>

ii) The grade points given above help in the evaluation of credit points earned by the student in a course as the credit points are equal to the number of credits assigned to the course multiplied by the grade points awarded to the student in that course. This shall be used in arriving at the credit index of the student for that semester, as it is the sum total of all the credit points earned by the student for all the courses registered in that semester.

8.8 Earning of Credits

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range S-E.
Letter grade ‘F’ in any course implies failure of the student in that course and no credits earned.

8.9 The Transitional Grades ‘I’, ‘W’ and ‘X’ would be awarded by the teachers in the following cases. These would be converted into one or the other of the letter grades (S-F) after the student completes the course requirements.

♦ Grade ‘I’: To a student having satisfactory attendance at classes and meeting the passing standard at CIE, but remained absent from SEE for valid & convincing reasons acceptable to the College, like:
  i) Illness or accident, which disabled him/her from attending SEE;
  ii) A calamity in the family at the time of SEE, which required the student to be away from the College;

♦ Students who remain absent for Semester End Examinations due to valid reasons and those who are absent due to health reasons are required to submit the necessary documents along with their request to the Controller of Examinations to write Make up Examinations within 2 working days of that particular examination for which he or she is absent, failing which they will not be given permission. This is admissible only for students who have more than 45 CIE marks.

♦ Grade ‘W’: To a student having satisfactory attendance at classes, but withdrawing from that course before the prescribed date in a semester under Faculty Advice

♦ Grade ‘X’: To a student having attendance ≥85% and CIE rating (90%), in a course but SEE performance observed to be poor, which could result in a F grade in the course. (No ‘F’ grade awarded in this case but student’s performance record maintained separately).

8.10 Grade Card: Each student shall be issued a Grade Card (or Transcript) at the end of each semester. This will have a list of all the courses registered by a student in the semester, together with their credits, the letter grades with grade points awarded. Only those courses registered for credit and having grade points shall be included in the computation of the students performance like SGPA and CGPA and the courses taken for audit will not form part of this computation. The results of mandatory courses, which are of the non-credit type shall also be reflected in the Grade card as PP (for Passed) or NP (for not passed). Each UG student shall have to obtain the grade PP in each mandatory course to qualify for the Degree awarded by the university.

8.11 The Make Up Examination
The Make Up Examination facility would be available to students who may have missed to attend the SEE of one or more course(s) in a semester for valid reasons and given the ‘I’ grade; Also, students having the ‘X’ grade shall be eligible to take advantage of this facility. The makeup examination would be held as per dates notified in the Academic Calendar. However, it would be
possible to hold a makeup examination at any other time in the semester with the permission of the Academic Council of the College. In all these cases, the standard of makeup examinations shall be same as the regular SEE for the course(s).

a) In the event of a student in the final semester failing in a Laboratory course and/or in CIE of a course, he/she could be given ‘I’ grade for the course. In such a case the concerned course instructor would have the possibility to grant the student extra time not exceeding 12 weeks for completing the course, with the concurrence of the Department/College. If no such extra time is sought/granted, the concerned student would have to re-register for the course in a succeeding semester and take steps to fulfill the requirements of the Degree.

b) All the ‘I’ and ‘X’ grades awarded to the students would be converted to appropriate letter grades after the make-up examinations. Any outstanding ‘I’ and ‘X’ grades after the last scheduled make-up examinations shall be automatically converted to ‘F’ grade.

c) All the ‘W’ grades awarded to the students would be eligible for conversion to the appropriate letter grades only after the concerned students re-register for these courses in a main/ supplementary semester and fulfill the passing standards for their CIE and (CIE+SEE).

9. EVALUATION OF PERFORMANCE
The overall performance of a student will be indicated by two indices: SGPA; which is the Semester Grade Point Average, and CGPA which is the Cumulative Grade Point Average.

SGPA for a semester is computed as follows.

\[
\text{SGPA} = \frac{\sum [ (\text{course credit}) \times (\text{Grade point}) ] \ (\text{for all courses in that semester})}{\sum [ (\text{course credits}) ]}
\]

CGPA is computed as follows:

\[
\text{CGPA} = \frac{\sum [ (\text{course credits})\times (\text{Grade points}) ] \ (\text{for all courses excluding those with F grades until that semester})}{\sum(\text{course credits})} \ (\text{for all courses excluding those with F grades until that semester})
\]

10. COMMUNICATION OF GRADES
The SGPA and CGPA respectively, facilitate the declaration of academic performance of a student at the end of a semester and at the end of successive semesters. Both of them would be normally calculated to the second decimal position, so that the CGPA, in particular, can be made use of in rank ordering the students' performance at a College. If two students get the same CGPA, the tie could be resolved by considering the number of
times a student has obtained higher SGPA; But, if it is still not resolved, the
number of times a student has obtained higher grades like S,A,B etc. could be
taken into account.

11. VERTICAL PROGRESSION (PROMOTION / ELIGIBILITY TO HIGHER
SEMESTERS)

11.1 There shall be no restriction for promotion from an odd semester to the
next even semester, provided the student has fulfilled the attendance
requirement.

11.1 A Student shall be declared fail if he / she
(i) Has not satisfied the CIE requirements of any Course/s.
(ii) Has not registered for the SEE even after satisfying the attendance and CIE
requirements.

11.3 (A) Vertical Progression in case of students admitted to First year:
(a) Students having not more than four F grades in the two semesters of first
year of the Programme shall be eligible to move to second year.
(a.1) Students having not more than four F grades in the four semesters of I and II
year shall be eligible to move to III year.
(a.2) Students who have earned all the prescribed credits of I year, and having not
more than four F grades in the four semesters of II and III year shall be eligible
to move to IV year.

(B) Vertical Progression in case of Diploma students admitted to Second
year (lateral entry):
(a) Students having not more than four F grades (excluding the Fail or pass
status of Additional Mathematics I and II) in the two semesters of II year of
the Programme shall be eligible to move to III Year.
(a.1) Students having not more than four F grades (excluding the Fail or pass
status of Additional Mathematics I and II, if any) in the four semesters of II and III year shall be eligible to move to IV year.

(b) The mandatory non-credit Courses Additional Mathematics I and II
prescribed at III and IV semesters respectively, to lateral entry Diploma
holders admitted to III semester of B.E/B.Tech. Programmes shall attend the
classes during the respective semesters to satisfy attendance and CIE
requirements and to appear for the University examinations.

(b.1) In case, any student fails to satisfy the attendance requirement of the
Courses Additional Mathematics I and II, he/she shall not be eligible to
appear for the Semester End Examinations of that semester and shall not
be permitted to take admission to next higher semester. The candidate
shall be required to repeat that semester during the subsequent year.

(b.2) Students who have satisfied the attendance requirement but not the CIE
requirements of the Courses Additional Mathematics I and II shall be
permitted to register afresh and appear for SEE after satisfying the CIE
requirements in the same Course/s (with or without satisfying the attendance
requirement) when offered during subsequent semester/s.
(c) Completion of Additional Mathematics I and II shall be mandatory for the award of degree.

(C) Vertical Progression in case of B.Sc students admitted to Second year (Lateral entry):
(a) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme) in the two semesters of II year of the Programme shall be eligible to move to III year.
(a.1) Students having not more than four F grades (excluding the Fail or pass status of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme, if any) in the four semesters of II and III year shall be eligible to move to IV year.
(b) The prescribed mandatory non-credit Courses Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme to lateral entry B. Sc holders admitted to III semester of B.E/B. Tech Programmes, shall attend the classes during the respective semesters to complete CIE and attendance requirements and to appear for the University examinations.
(b.1) In case, any student fails to satisfy the attendance requirement of the above said Courses; he/she shall not be eligible to appear for the Semester End Examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.
(b.2) Students who have satisfied the attendance requirement but not the CIE requirements of the above said Courses, shall be permitted to register afresh and appear for SEE after satisfying the CIE requirements in the same Course/s (with or without satisfying the attendance requirement) when offered during subsequent semester/s.
(c) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics shall be mandatory for the award of degree.
The Principal of each college shall make suitable arrangements in the timetable to facilitate the B. Sc students to attend the above mentioned courses to satisfy the CIE and attendance requirements and to appear for the University examinations.

11.4 Termination from the programme
A student shall be required to withdraw (discontinue) from the programme and leave the college on the following grounds.
 i) Failure to secure a CGPA = 5.0 on three consecutive occasions.
 ii) Failure to earn a credit of 175 (135 for lateral entry students) in 8 years (6 years for lateral entry students) of duration from the year of admission including the duration of temporary withdrawal (leave of absence).
 iii) Absence from classes for more than six weeks at a time in a semester without leave of absence being granted by competent authorities.
 iv) Failure to meet the standards of discipline as prescribed by the college from time to time.
12. AWARD OF CLASS

Sometimes, it would be necessary to provide equivalence of these averages, viz., SGPA and CGPA with the percentages and/or Class awarded as in the conventional system of declaring the results of University examinations. This can be done by prescribing certain specific thresholds in these averages for Distinction, First Class and Second Class. This can be seen from the following Table.

<table>
<thead>
<tr>
<th>Grade Point</th>
<th>Percentage of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.75</td>
<td>50 (second class)</td>
</tr>
<tr>
<td>6.25</td>
<td>55</td>
</tr>
<tr>
<td>6.75</td>
<td>60 (First class)</td>
</tr>
<tr>
<td>7.25</td>
<td>65</td>
</tr>
<tr>
<td>7.75</td>
<td>70 (Distinction)</td>
</tr>
<tr>
<td>8.25</td>
<td>75</td>
</tr>
</tbody>
</table>

Percentage = (GPA - 0.75) x 10

13. APPEAL FOR REVIEW OF GRADES

a. The entire process of evaluation shall be made transparent and the course instructor shall explain to a student why he/she gets whatever grade he/she is awarded, if and when required. A mechanism for review of grade is incorporated in the evaluation system. However, before appealing for such review, a student shall first approach the concerned course Instructor and then the concerned DUGC, with the request to do the needful; and only in situations where satisfactory remedial measures have not been taken, the student may then appeal to the Department Academic Appeals Boards (DAAB) before the date specified in Academic Calendar, by paying the prescribed fees.

b. The fee for such an appeal will be decided by the Senate from time to time. If the appeal is upheld by DAAB, then the fee amount will be refunded to the student.

14. AWARD OF DEGREE

14.1 (1) B.E. Degree

a) Students shall be declared to have completed the Programme of B.E./B.Tech. degree and is eligible for the award of degree, provided the students have undergone the stipulated Course work of all the semesters under the Scheme of Teaching and Examinations and has earned the prescribed number of credits (175 credits for regular students registered for 4 year degree programmes & 135 for lateral entry students).

b) For the award of degree, a CGPA≥5.00 at the end of Programme shall be mandatory.

c) Completion of Additional Mathematics I and II, shall be mandatory for the award of degree to lateral entry diploma students.
d) Completion of Engineering Graphics and Elements of Civil Engineering and Mechanics of First Year Engineering Programme shall be mandatory for the award of degree to lateral entry B.Sc. graduates.

e) (i) Over and above the academic credits, every Day College regular student admitted to the 4 years Degree Programme and every student entering 4 years Degree Programme through lateral entry, shall earn 100 and 75 Activity Points respectively through AICTE Activity Point Programme for the award of degree. Students transferred from other Universities/Autonomous colleges under VTU to fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student’s eight semester Grade Card.

(ii) Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points before the commencement of 8th semester examinations, eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

(2) B.E. (Honors) Degree

VTU, Belagavi has framed the guidelines for applying for the award of Bachelor of Engineering (Honors) degree.

These Regulations are applicable for the following students:

1. Admitted to I semester / I year from the academic year 2018-19 (i.e. USN XXX18XXXXX)

2. Admitted to III semester / II year from the academic year 2019-20 (i.e. USN XXX19XX4XX)

3. These Regulations are uniformly applicable to Affiliated, Autonomous and Constituent Colleges under VTU.

Eligibility criterion

(i) Students have to earn 18 or more additional credits through MOOCs.

(ii) Students shall register for this course from fifth semester onwards.

(iii) Students shall obtain a grade ≥ D in all the courses in first attempt only in all the semesters till 5th.

(iv) Students shall obtain CGPA of 8.5 and above at the end of fourth semester.

(v) For Diploma students, they shall complete Additional Mathematics I and II during 3rd and 4th semesters in first attempt only.

Requirements:

(i) Students shall maintain a grade ≥D in all courses from 5th to 8th semester in ‘first attempt’ only.
(ii) Students not having CGPA greater than or equal to 8.5 at the end of the B.E. programme shall not be eligible for the award of Honors degree, even if they have satisfied the requirement of additional credits.

(iii) Students shall take up additional course work, other than the regular courses prescribed by the University from 5th to 8th semester from NPTEL and other platforms notified by the University and complete the same in any number of attempts with a final score (online assignments: 25 % + Proctored examination: 75 %) leading to the following certificates – ELITE (60 to 75 %) or ELITE + SILVER (76 to 89 %) or ELITE + GOLD (≥ 90 %) before closure of eighth semester as per the academic calendar.

(iv) Students shall be permitted to drop the registered course work (s) and select alternative course work (s) in case they cannot give proctored examination.

(v) Students have to take courses from the list of MOOCs approved by the University, which can be from NPTEL / SWAYAM / other platforms.

(vi) Students shall select courses in consultation with their Class Advisor, such that the content / syllabus of them are not similar to that of the core courses, professional electives or open electives, which the students may chose in the program.

(vii) Students shall earn the additional credits for these courses through MOOCs, by only appearing in person to the proctored examinations conducted by NPTEL / SWAYAM / other platform. The method of assessment shall be as per NPTEL online platform.

(viii) The Credit equivalence shall be as follows - 4 weeks of online course duration – 1 credit, 8 weeks of online course duration – 2 credits and 12 weeks of online course duration – 3 credits.

**Registration:**

(i) Any student meeting the eligibility criteria and interested to register for Honors degree qualification shall apply to the University through the Principal in the prescribed form along with the prescribed application fees within 15 working days after notification by the University.

(ii) The Registrar shall notify the registration of the student and it will be notified to the student and the student shall pay a one-time, non-refundable registration fees as prescribed by the University to confirm the registration.

**Award of Honors Qualification:**

(i) Students who successfully complete the MOOCs prescribed by the University and submit their E-certificates to the University through the Principal against the notification issued by the Registrar in time before the closure of eighth semester, as per the academic calendar shall be eligible for B.E. (Honors) degree. If a student does not submit the
certificates in time on or before the last date, their request shall not be considered, even if they have earned the requisite number of credits.

(ii) The Honors degree shall be awarded only if the CGPA at the end of the B.E. programme is equal to or greater than 8.5.

(iii) A student who has earned the requisite number of credits and who has submitted the certificates in time and has been accepted by the University will get B.E. degree with Honors suffixed indicating recognition of higher achievement by the student concerned.

(iv) Further students fulfilling all the above requirements shall be entitled to receive their transcripts indicating both the achievement of the student concerned.

(v) The award of the Honors degree shall be recommended by the Academic Senate and approved by the Executive Council of the University.

14.2 (1) Noncompliance of CGPA ≥ 5.00 at the end of the Programme

(a) Students, who have completed all the courses of the Programme but not having a CGPA ≥ 5.00 at the end of the Programme, shall not be eligible for the award of the degree.

(b) In the cases of 14.2 (1) a, students shall be permitted to appear again for SEE in course/s (other than Internship, Technical seminar, Project (Mini and Main), and Laboratories) of any Semester/s without the rejection of CIE marks for any number of times, subject to the provision of maximum duration of the Programme to make up the CGPA equal to or greater than 5.00 for the award of the Degree.

(c) In case, the students earn improved grade/s in all the reappeared course/s, the CGPA shall be calculated considering the improved grade/s. If it is ≥5.00, the students shall become eligible for the award of the degree. If CGPA <5.00, the students shall follow the procedure laid in 14.2 (1) b

(d) In case, the students earn improved grade/s in some course/s and the same or lesser than the previously earned pass grade/s in the other reappeared course/s, the CGPA shall be calculated considering the improved grade/s and the pass grades earned before the reappearance. If it is ≥5.00, the students shall become eligible for the award of the degree. If CGPA<5.00, the students shall follow the procedure laid in 14.2 (1) b

(e) In case, the students earn improved grade/s in some courses and fail in the other reappeared course/s, the CGPA shall be calculated by considering the improved grade/s and the previously earned pass grade/s of the reappeared course/s in which the students have failed. If it is≥5.00, the students shall become eligible for the award of the degree. If CGPA<5.00, the students shall follow the procedure laid in 14.2 (1) b

(f) In case, the students fail (i.e., earns F grade) in all the reappeared course/s, pass grade/s of the course/s earned by the students before reappearance shall be retained. In such cases, the students shall follow the procedure laid in 14.2 (1) b
(g) Students shall obtain written permission from the Registrar (Evaluation) to reappear in SEE to make up the CGPA equal to or greater than 5.00.

(2) Noncompliance of Mini-project
(a) The mini-project shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the mini-project shall be declared fail in that course and shall have to complete the same during subsequent University examinations after satisfying the Mini-project requirements. Also, mini-project shall be considered for eligibility to VII semester.

(3) Noncompliance of Internship
(a) All the students of B.E/B.Tech shall have to undergo mandatory internship of 4 weeks during the vacation. A University examination shall be conducted during VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take-up/complete the internship shall be declared fail in that course and shall have to complete the same during subsequent University examinations after satisfy the internship requirements.

14.3 The maximum duration for a student for complying to the Degree requirements is 16 – semesters from the date of first registration for his first semester (8 years from the date of admission to first year, (12 semesters / 6 years from the date of admission for lateral entry student)).

15 GRADUATION REQUIREMENTS AND CONVOCATION

15.1 A student shall be declared to be eligible for the award of the degree if he/she has
   a) Fulfilled “Award of Degree” Requirements
   b) No Dues to the College, Departments, Hostels, Library, Central Computer Centre and any other centres
   c) No disciplinary action pending against him/her.

15.2 The award of the degree must be recommended by the Senate

15.3 Convocation

Degree will be awarded for the students who have graduated during the preceding academic year. Students are required to apply for the Convocation along with the prescribed fees, after having satisfactorily completed all the degree requirements (refer ‘Award of Degree’) within the specified date in order to arrange for the award of the degree during convocation.

16 AWARD OF PRIZES, MEDALS, CLASS & RANKS

For the award of Prizes and Medals, the conditions stipulated by the Donor
may be considered as per the statutes framed by the College for such awards.

Sometimes, it would be necessary to provide equivalence of these averages, viz., SGPA and CGPA with the percentages and/or Class awarded as in the conventional system of declaring the results of University examinations. This can be done by prescribing certain specific thresholds in these averages for Distinction, First Class and Second Class as described in 12.

17 CONDUCT AND DISCIPLINE

17.1 Students shall conduct themselves within and outside the premises of the College in a manner befitting the students of an Institution of National Importance.

17.2 As per the order of Honorable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

17.3 The following acts of omission/ or commission shall constitute gross violation of the Code of Conduct and are liable to invoke disciplinary measures:

a) Ragging.

b) Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus.

c) Willful damage or stealthy removal of any property/belongings of the College/Hostel or of fellow students/citizens.

d) Possession, consumption or distribution of alcoholic drinks or any kind of hallucinogenic drugs.

e) Mutilation or unauthorized possession of Library books.

f) Noisy and unseemly behaviour, disturbing studies of fellow students.

g) Hacking in computer systems (such as entering into other Person’s area without prior permission, manipulation and/or Damage of computer hardware and software or any other Cyber crime etc.).

h) Plagiarism of any nature.

i) Any other act of gross indiscipline as decided by the Senate from time to time.

j) Use of Mobile in the college Academic area.

k) Smoking in College Campus and supari chewing.

l) Unauthorized fund raising and promoting sales.

Commensurate with the gravity of offence the punishment may be: reprimand, expulsion from the hostel, debarring from an examination, disallowing the use of certain facilities of the College, rustication for a specified period or even outright expulsion from the College, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
17.4 For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Dean (Academics), respectively, shall have the authority to reprimand or impose fine.

17.5 All cases involving punishment other than reprimand shall be reported to the Principal.

17.6 Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Controller of Examinations for taking appropriate action.

18. EARNING OF ACTIVITY POINTS FOR THE AWARD OF DEGREE
18.1 As per VTU guidelines, every student entering 4 year degree programme should earn 100 activity points & every student entering 4 year degree programme through Lateral Entry should earn 75 activity points for the award of the Engineering Degree.
18.2 The Activity Points earned will be reflected on the student’s eighth semester Grade Card.
18.3 The activities can be spread over the years (duration of the programme) any time during the semester weekends and holidays, as per the interest & convenience of the students from the year of entry to the programme.
18.4 Activity Points (non-credit) have no effect on SGPA/CGPA point.
18.5 In case students fail to earn the prescribed Activity Points, Eighth semester Grade Card shall be issued only after earning the required Activity Points.

Note: Students are required to be inside the examination hall, 20 minutes before the commencement of examination. This is applicable for all examinations (Semester end/Supplementary/makeup) henceforth. Students will not be allowed inside the examination hall after the commencement, under any circumstances.

*******
# List of Major Scholarships

<table>
<thead>
<tr>
<th>Applicable to</th>
<th>Types of Scholarship</th>
<th>Method</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>For SC/ST Students</td>
<td>Income : Below Rs.2,50,000/-</td>
<td>Online application</td>
<td>SSP</td>
</tr>
<tr>
<td></td>
<td>Income : Above Rs.2,50,000/- to Rs.10,00,000/-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For Others</td>
<td>Category I :</td>
<td>Online application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Category 2A, 3A, 3B, &amp; GM Income Below Rs.1,00,000/-</td>
<td>Online application</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minority students Income Below Rs.2,50,000/-</td>
<td>Online application</td>
<td>NSP &amp; SSP</td>
</tr>
<tr>
<td>Parents must have Beedi Id. Card</td>
<td>Beedi Scholarship</td>
<td>Online application</td>
<td>scholarships.gov.in or nsp.gov.in</td>
</tr>
<tr>
<td>1st year Students</td>
<td>Central Sector Scholarship (MHRD)</td>
<td>Online application</td>
<td>scholarships.gov.in or nsp.gov.in</td>
</tr>
<tr>
<td>1st year Students</td>
<td>AICTE-Pragati etc</td>
<td>Online application</td>
<td><a href="http://www.aicte-india.org">www.aicte-india.org</a></td>
</tr>
</tbody>
</table>

1. Scholarship details will be published in the notice board near College Academic Section. Students must see the notice board and submit the application before due dates.
2. All SC/ST and Category I students who have not paid any fee in CET must apply for Fee concession or Scholarship. Otherwise they must pay the tuition fee and college fee.
3. The students, who are applying for any of the above scholarship through online, must submit the hardcopy with supporting documents (with attestation) to the academic section in time.
B. E. SYLLABUS

ELECTRICAL & ELECTRONICS ENGINEERING
2020-24 Batch

III & IV SEMESTER

With Scheme of Teaching & Examination
<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of Faculty</th>
<th>Qualification</th>
<th>Designation</th>
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<tr>
<td>1.</td>
<td>Dr. Nagesh Prabhu</td>
<td>Ph.D.</td>
<td>Professor</td>
</tr>
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<td>2.</td>
<td>Dr. Sathyendra Kumar</td>
<td>Ph.D.</td>
<td>Professor</td>
</tr>
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<td>3.</td>
<td>Dr. Suryanarayana K.</td>
<td>Ph.D.</td>
<td>Professor &amp; HOD</td>
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<tr>
<td>4.</td>
<td>Mr. K. Vasudeva Shettigar</td>
<td>M.Tech</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>5.</td>
<td>Dr. Nayana Shetty</td>
<td>Ph.D.</td>
<td>Associate Professor</td>
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<td>6.</td>
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<td>7.</td>
<td>Mr. Naveen J.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
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<td>8.</td>
<td>Mr. Pradeep Kumar</td>
<td>M.Tech (Ph.D.)</td>
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<td>9.</td>
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<td>12.</td>
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</tr>
<tr>
<td>13.</td>
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</tr>
<tr>
<td>14.</td>
<td>Mr. Girisha Joshi</td>
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<td>15.</td>
<td>Mrs. Soumya Rani Mestha</td>
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<td>16.</td>
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<td>17.</td>
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<td>18.</td>
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<td>Mrs. Swathi Hatwar H.</td>
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<td>20.</td>
<td>Mrs. Palimaru Aparna</td>
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<td>22.</td>
<td>Mr. Krishna Rao</td>
<td>M.Tech (Ph.D.)</td>
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Vision
Pursuing excellence in Electrical & Electronics Engineering, creating a research environment to promote innovation and address global challenges.

Mission
- To equip students to face global challenges by excelling in professional career and higher education.
- To offer high quality graduate and post graduate programs in electrical & electronics engineering.
- To promote excellence in research, collaborative activities and contribute to social development with ethical values.

Programme Educational Objectives (PEO)
1. Excel in professional career and / or higher education by acquiring knowledge in mathematical, electrical, electronics and computer engineering principles.
2. Analyze real life problems, design electrical and electronics & multidisciplinary engineering systems and solutions that are socially acceptable
3. Inculcate and exhibit ethical values, communication skills and provide supportive and leadership roles in their profession to emerge as excellent professionals and adapt to current trends by engaging in lifelong learning to promote research.
Programme Outcomes (PO) 
At the end of B.E (E&E) program the students will have an ability to

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

PO2 Problem analysis: Identify, formulate, review research literature, analyze complex Electrical & Electronics Engineering problems and draw substantiated conclusions by applying the principles of mathematics, basic science and engineering sciences.

PO3 Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

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

PO5 Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6 The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.

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

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

PO10 Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11 **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSO)**

PSO1 An ability to demonstrate the electrical and electronics engineering concepts by developing working models.

PSO2 Ability to model, simulate and develop application specific systems to meet industrial /societal needs.
# DETAILED SCHEME AND SYLLABUS FOR 2020-24 BATCH

## III Semester (2020-24)

<table>
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<td>9.</td>
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L – Lecture   T- Tutorials   P – Practical   S – Self Study   J- Project Based Learning
CORE COURSES – III SEMESTER

VECTOR CALCULUS AND TRANSFORM TECHNIQUES

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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Teaching Department: Mathematics

Course Learning Objectives:
1. Apply operators like gradient, divergence and curl to both scalar as well as vector functions and evaluate surface and volume integrals in terms of line integrals using various integral theorems.
2. Identify the functions in engineering problems as analytic function and their study as a function of a complex variables.
3. Study Cauchy’s theorem and formulae, and specify some difficult integration that appear in applications can be solved by complex integration.
4. To perform Fourier analysis on non-sinusoidal periodic signals.
5. To introduce Z-transform and its applications to solve difference equation.

UNIT – I

VECTOR CALCULUS
Vector algebra (review), vector differentiation—gradient, directional derivatives, divergence, curl, Laplacian, solenoidal and irrotational vectors. Curvilinear, spherical, and cylindrical coordinates.

UNIT – II

THEORY OF COMPLEX VARIABLES
Functions of complex variables, Cauchy Riemann equations, properties of analytic functions, conformal mapping, bilinear transformations.

UNIT – III

FOURIER ANALYSIS
Periodic functions, Euler’s formulae, Trigonometric Fourier series.
Course Outcomes:
At the end of the course student will be able to
1. Demonstrate the applications of Gauss divergence and Stoke's theorem.
2. Solve Engineering problems using complex variable techniques.
3. Illustrate the concept of complex variables and line integrals in complex plane.
4. Apply the analytical technique to express periodic function as a Fourier sine and cosine series.
5. Apply the concepts of Z- transforms to solve engineering problems.

Course Outcomes Mapping with Program Outcomes & PSO

<table>
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</table>

1: Low 2: Medium 3: High

SEE Question Paper Pattern:
- There will be 8 questions of 20 marks each in the question paper categorized into 3 Units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 2 full questions each from Unit - I & Unit – II and 1 full question from Unit – III.

TEXTBOOKS:

REFERENCE BOOKS:

E Books / MOOCs/ NPTEL
1. NPTEL Course on Integral and Vector Calculus, Prof. Hari Shankar Mahato, IIT Kharagpur
2. NPTEL Course on Advanced Engineering Mathematics, Prof. P. N. Agarwal, IIT Roorkee
3. https://www.coursera.org/learn/calculus1
4. https://www.coursera.org/learn/advanced-calculus

***************
NETWORK ANALYSIS

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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

J- Project Based Learning (PBL) using MultiSim & Virtual Lab

Prerequisites: Basic Electrical Engineering (20EE104)

Course Learning Objectives:
1. To familiarize the basic laws, theorems and the methods of analysing electrical circuits.
2. To explain the concept of resonance and coupling in electric circuits.
3. To familiarize the analysis of three-phase circuits.
4. To analyze the transient response of circuits with dc and sinusoidal ac input.
5. To impart basic knowledge on network analysis using Laplace transforms.

UNIT – I

Independent and dependent sources, source transformation, DC and AC multi-loop circuit analysis- mesh, node and mixed mesh and node analysis for electric circuit with linearly dependent and independent sources.

7*+5 Hours

UNIT – II

Coupled circuits & Resonance: Coefficient of coupling, dot convention for coupled coils and analysis of simple coupled circuits. Series and parallel resonance, Q factor, bandwidth.

Unbalanced Three-phase systems: Analysis of three-phase unbalanced systems, neutral shift, calculation of real and reactive powers.

8*+5 Hours

UNIT – III

Network theorems: Superposition, Reciprocity, Thevenin’s and Norton’s theorem, Maximum power transfer theorem, Telligen’s theorem, Millman’s theorem as applied to AC and DC circuits.

8*+5 Hours

UNIT – IV

Transient behavior and initial conditions: Behavior of circuit elements under switching. Conditions and their representations, evaluation of initial and final conditions in RL, RC and RLC circuits with AC and DC excitations, Solution of network equations including coupled circuits.

8*+5 Hours

UNIT – V


Two port networks: Short circuit admittance parameters, Open circuit impedance parameters, T-, H- parameters, Relationship between parameter sets.

8*+6 Hours
Note: Suggested topics for Task using PSpice
1. Verification of KCL and KVL for multi-loop electrical circuits with DC and AC controlled independent sources.
2. Series and parallel resonance plot of current, impedance, admittance, power factor Vs frequency and determination of Q factor and bandwidth.
3. Verification of Thevenin’s, Norton’s theorem for AC and DC circuits
4. Verification of Maximum power transfer theorem.

Course Outcomes:
At the end of the course student will be able to
1. Apply KCL & KVL to solve the DC and AC circuits.
2. Analyze coupled circuits, electrical resonance and unbalanced three-phase circuits to compute associated circuit parameters.
3. Apply the network theorems to estimate steady state response for a given excitation.
4. Analyze the RL, RC and RLC circuits with AC & DC excitation to evaluate transient and steady state response.
5. Apply the concept of Laplace transform and two port network parameters to simplify the network computations.

<table>
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<tr>
<th>Program Outcomes Mapping with Program Outcomes &amp; PSO</th>
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1: Low 2: Medium 3: High

SEE QUESTION PAPER PATTERN:
- There will be 10 questions of 20 marks each in the question paper categorized into 5 units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting one full question from each unit.

TEXTBOOKS:

REFERENCE BOOKS:
E Book /MOOC / NPTEL
1. NPTEL Course on Network Analysis
2. http://nptel.ac.in/courses/108106075/
3. http://nptel.ac.in/courses/108105065/

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DC AND SYNCHRONOUS MACHINES

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*Note: Lecture hours indicated is for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Prerequisites: Basic Electric Engineering (20EE104)

Course Learning Objectives:
At the end of the course student will be able to
1. To understand the working principle and operating characteristics of DC machine
2. To understand testing methods of DC Machine
3. To study the working principle and operating characteristics of Synchronous machine
4. To get acquainted with methods to predetermine voltage regulation of synchronous generator.
5. To understand the process of synchronization of alternator to infinite bus.
6. To get familiarized with the working principle, characteristics, testing and applications of Synchronous motor.

UNIT – I

DC Motors: Review of operating principle, Armature reaction, commutation, use of interpole & pole face compensating winding Characteristics, Speed control of shunt & series motors, losses & efficiency, condition for maximum efficiency. 5*+6 Hours

DC Motor Starter: necessity, 3-point, 4-point starter
Testing of DC motors – Swinburne’s test, Hopkinson’s test, Retardation test, Field’s test on series motor 3*+3 Hours

Special Motors: Principle of operation of Brushless DC motor, Servo motor and Stepper motors, Permanent magnet DC motors. 2*+0 Hours

UNIT – II

Synchronous machines-Review of principle of operation, construction of salient & non Salient pole synchronous machines. Generated EMF in a concentrated winding, effect of distribution of winding & use of chorded coils, Regulation by EMF, MMF, ZPF Methods. 6*+6 Hours
Parallel operation of alternators, Synchronizing of Alternators to infinite bus bars, operating characteristics, power angle characteristics, operation at constant load with variable excitation for generating mode. 

5*+5 Hours

UNIT – III

Salient pole synchronous machines, two reaction theory, power angle diagram, reluctance power, slip test.

2*+2 Hours

**Synchronous Motors:** Principle of operation, starting methods. Motor at constant load variable excitation. V and inverted V curves, hunting in synchronous machines, synchronous condenser and Applications

3*+4 Hours

**Course Outcomes:**
At the end of the course student will be able to

1. Describe the effect of the armature reaction to justify the use of inter-poles and compensating winding.
2. Analyze the characteristics, starters and testing methods to select and evaluate the performance parameters of different DC motors.
3. Outline the constructional features of an alternators and describe tests to predetermined the voltage regulation.
4. Describe the process of synchronization of alternators and analyze its performance characteristics.
5. Analyze the performance of salient pole synchronous machine, starting methods and applications of synchronous motor.

**Course Outcomes Mapping with Program Outcomes & PSO**

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1: Low 2: Medium 3: High

**SEE Question Paper Pattern:**
- There will be 8 questions of 20 marks each in the question paper categorized into 3 Units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 2 full questions each from Unit - I & Unit – II and 1 full question from Unit – III.

**TEXTBOOKS:**
2. J.B. Gupta, AC and DC Machines, S K Kataria and Sons publications, 2012 edition
REFERENCE BOOKS:
1. AE Clayton & Hancock, Performance & design of DC machine ELBS Publication, 1st edition, 2004

E Books /MOOC /NPTEL
1. NPTEL Course on Electrical Machines - I, Prof. Tapas Kumar Bhattacharya, IIT Kharagpur
2. NPTEL Course on Electrical Machines - II, Prof. Tapas Kumar Bhattacharya, IIT Kharagpur

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ANALOG ELECTRONIC CIRCUITS

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*Note: Lecture hours indicated is for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Prerequisites: Basic Electronics (19EC112)

Course Learning Objectives:
1. To analyze applications of diode for clipper and clamper circuits.
2. To understand the structural properties, characteristics and operation of MOSFET and JFET.
3. To study the MOSFET parameters when used as an amplifier and as a switch.
4. To use MOSFET as a single stage amplifier and analyze its behavior at various frequencies.
5. To introduce the concept of feedback and analyze the oscillator circuits using MOSFET.
6. To analyze the differential & multistage amplifiers and various parameters associated with them.

UNIT – I

Diode Circuits: Diode applications for clipper and clamper circuit.  
MOSFET: Device structure and Physical operation, I-V Characteristics, Depletion type MOSFET, Enhancement Type MOSFET, Junction Field Effect Transistor (JFET).

UNIT – II

MOSFET as an Amplifier and as a switch: Large signal operation, Graphical derivation of the transfer characteristics, operation as a switch, operations as a linear amplifier, Analytical expressions.

Biasing in MOS Amplifier circuits: Biasing by Fixing V_{GS}, biasing by fixing V_{GS} and
connecting a resistance in the source, Biasing using a Drain-to-gate feedback amplifier, Biasing using a constant current source.

**Small-signal operation and models:** DC bias point, signal current in the drain terminal, voltage gain, DC analysis and signal analysis, small signal equivalent, Transconductance, T equivalent circuit model.

**UNIT – III**

**Single Stage MOS Amplifiers:** Basic Structure, characterizing amplifiers, Common source amplifier, CS amplifier with a source resistance, Common gate amplifier, Common drain amplifier.

**MOSFET Internal Capacitances and high frequency model:** Gate capacitive effect, junction capacitances, high frequency MOSFET model, Unity- Gain frequency, Circuit operation of CMOS Logic Inverter.

**UNIT – IV**

**MOS Amplifiers:** Frequency Response of CS amplifier, CS amplifier with active load, Miller’s Theorem, MOS current mirror.

**Feedback Amplifiers & Oscillators:** General Feedback structure, Properties of negative feedback, Feedback topologies, Practical feedback amplifier, FET based RC phase shift oscillator, FET crystal oscillator.

**UNIT – V**

**Differential and Multistage FET Amplifiers:** MOS Differential pair with common mode and differential input voltage, Small-signal operation of MOS Differential pair, Common-mode Gain, CMRR and effect of Rd & gm mismatch on CMRR, Differential Amplifier with Active Load, Frequency response of the differential amplifier, Multistage Amplifier, Two-stage CMOS Op Amp.

**Course Outcomes:**
At the end of the course student will be able to
1. Use diodes to design clipper and clamper circuits and analyze internal structure, working of MOSFET&JFET to infer the operating characteristics.
2. Analyze the large-signal behavior of the MOSFET, design bias circuits to locate operating point and small-signal operation to obtain the transconductance.
3. Analyze CS, CG & CD MOSFET single-stage amplifier circuitsto obtain performance parameters.
4. Perform frequency sweep on CS MOS amplifier circuit to obtain the response curve and analyze feedback concepts to design oscillator circuits.
5. Analyze the differential and multistage amplifiers to compute circuit parameters.

**Course Outcomes Mapping with Program Outcomes & PSO**

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1: Low 2: Medium 3: High
SEE QUESTION PAPER PATTERN:
- There will be **10** questions of **20** marks each in the question paper categorized into **5** units as per the syllabi & contact hours. The student will have to answer **5** full questions, selecting **one full** question from **each unit**.

TEXTBOOKS:

REFERENCE BOOKS:

E-Books / MOOC:
1. Electronics for analog signal processing -I, Prof. K Radhakrishna Rao, IIT Madras
2. NPTEL Course on Analog Electronic Circuits by Prof. Pradip Mandal, IIT Kharagpur
3. Introductory Analog Electronics Laboratory (Spring 2007) by MIT Open Courseware
4. Microelectronic Devices and Circuits on MIT Open Courseware
5. NPTEL Course on Analog Electronic Circuit by Prof. Shouribratachatterjee, IIT Delhi
6. MOS Transistors by Columbia University on Coursera

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LOGIC DESIGN

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Prerequisites: Basic Electronics (20EC112)

Course Objectives:
1. To impart the knowledge of combinational circuit design.
2. To impart the knowledge of Sequential circuit design.

UNIT – I


Combinational Logic Circuits: Sum of Product, Product-of-sum forms, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh simplifications, Don’t Care Conditions, Map entered variables. 7 Hours

Analysis and design of combinational logic - I: General approach for combinational design, Decoders, BCD decoders, Encoders, Priority Encoder. 4 Hours

Analysis and design of combinational logic - II: Digital multiplexers- Using multiplexers as Boolean function generators, Demultiplexers, Adders and subtrators, cascading full adders- Ripple Carry, Carry Look ahead, Binary comparators. 4 Hours

UNIT – II


Sequential Circuits – 2: Characteristic Equations, Registers-Shift registers, Bidirectional shift registers, Universal shift registers, Counters- Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-n Counter using clocked JK Flip-Flops, D, T, or SR Flip-Flops, Design of synchronous UP/DOWN counter, Decade counter. 7 Hours

UNIT – III

Sequential Design - I: Introduction to Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis. 6 Hours

Digital Integrated circuits: Introduction, RTL, DTL circuits, ECL, TTL, MOS, CMOS, I2L 3 Hours
Course Outcomes:
At the end of the course student will be able to
1. Recall basic gates, Boolean algebra and apply K-map technique to simplify Boolean expressions.
2. Design combinational logic circuits for the given requirements.
3. Identify and describe working of latches and Flip Flops.
4. Design of sequential logic circuits for the given specifications
5. Design clocked synchronous sequential networks and comprehend the operation of digital integrated circuits.

Course Outcomes Mapping with Program Outcomes & PSO

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1: Low 2: Medium 3: High

SEE Question Paper Pattern:
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TEXTBOOKS:

REFERENCE BOOKS:

E Books /MOOC /NPTEL
1. NPTEL Course on Digital Circuits By Prof. Santanu Chattopadhyay, IIT Kharagpur
2. NPTEL Course on Switching Circuits and Logic Design By Prof. Indranil Sengupta, IIT Kharagpur

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INSTRUMENTATION AND MEASUREMENTS

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*Self-Study Topics- To be covered under the supervision of the course instructor.

**Prerequisites:** BEE (20EE104)

**Course Learning Objectives:**
1. To measure the resistance, inductance, and capacitance by using different bridges.
2. To study the construction and working of various meters used for measurement of electrical quantities.
3. To introduce various sensors and transducers, study their working and applications.
4. To introduce various electronic instruments & display devices and learn their applications.

**UNIT – I**

**Instruments:** Introduction, Characteristic of instruments, errors


**Extension of Instrument Ranges:** Principles of Shunts and multipliers used to extend instrument range, examples, Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and Illustrative examples.

**Energy Meter:** Errors, adjustments and calibration of Induction type energy meter. Introduction to Digital Energy Meter  
**SS Topic:** Megger. Turns compensation.

15 Hours

**UNIT – II**

**Sensors:** Role of sensors in engineering, classification of transducers.

**Frequency and Phase:** Principle of measurement of frequency and phase angle, Weston frequency meter, power factor meter and phase sequence indicator.

**Linear Displacement:** Resistive Potentiometers, strain gauge, LVDT, Capacitive Piezoelectric, Hall Effect sensors, Optical displacement sensor, fiber optic sensor, Ultrasonic distance Sensor, Linear encoder.

**Rotational Displacement:** Optical tachometer, Rotary encoder, gyroscope.

**Temperature measurement:** Classification of temperature sensors Resistance Temperature Detectors, Thermistor.

**Recorder:** Magnetic recording, digital recording, optical recording.

**SS Topic:** Proximity sensors, Thermocouple.

14 Hours

**UNIT – III**

**Display devices:** 7 segment display, dot matrix displays, LCD and LED display. Photo conductive, photo-voltaic cells.

**Electronic Instruments:** Introduction, True RMS responding voltmeter, Electronic multimeters, ADC (Flash, SAR), DAC, Digital voltmeters, block diagram of a digital
storage oscilloscope, Method of measuring amplitude, period, phase, frequency, Use of Lissajous patterns, broken ring and modulated ring method, Sampling Oscilloscope.

SS Topic: Q meter

Course Outcomes:
At the end of the course student will be able to
1. Apply a suitable measurement technique to determine the value of unknown resistance/capacitance/ inductance.
2. Describe the extension of instrument range to measure the large voltages & currents and calibrate the energy meter.
3. Describe the principle of different sensors for the measurement of frequency, and linear displacement.
4. Describe the principle of different sensors for the measurement of rotational displacement, temperature and recording the measured quantities using recorders.
5. Illustrate the working of display devices and different electronic instruments to measure analog/digital signals.

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TEXTBOOKS:

REFERENCE BOOKS:
E Books /MOOC /NPTEL
3. http://nptel.ac.in/courses/108105064/

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**ANALOG ELECTRONICS CIRCUITS LABORATORY**

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Course Learning Objectives:
1. To design and test diode application circuits.
2. To study the MOSFET characteristics
3. To design and test biasing circuits of MOSFET.
4. To use MOSFET as an amplifier and verify its frequency response.
5. To design and test MOSFET based CMOS inverter and oscillator circuit.

List of Experiments
1. Design & test diode clipping and clamping circuits.
2. Study of MOSFET characteristics and determine transconductance & output resistance.
3. Design different types of biasing circuits and validate the operating point.
4. Design Common Source (CS) MOSFET amplifier to determine frequency response.
5. Study small-signal model behavior of CS amplifier and determine voltage dependent current source property of CS amplifier.
6. Design MOSFET source follower to determine input & output impedance.
7. Design and test MOSFET based RC phase shift oscillator.
9. Design multistage MOSFET amplifier circuit to determine frequency response, input & output impedance.
10. Design CMOS inverter (using PMOS and NMOS) and analyze switching characteristics.

Course Outcomes:
At the end of the course student will be able to
1. Design diode based clipping and clamping circuits to meet the design specifications.
2. Verify MOSFET characteristics and biasing circuits to validate operating point.
3. Use MOSFET for amplifier applications to determine the gain, frequency response, input & output impedances.
4. Design MOSFET based oscillator circuits to generate required frequency signals.
5. Use MOSFET as CMOS inverter to determine switching characteristics.
Course Outcomes Mapping with Program Outcomes & PSO

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LOGIC DESIGN LABORATORY

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Course Learning Objectives:
1. To Simplify and verify combination logic circuit
2. To Simplify and verify sequential logic circuit.

List of Experiments
1. Simplification, realization of Boolean expressions using logic gates/Universal gates.
2. Realization of Half/Full adder and subtractor using logic gates.
3. Realization of Binary to Gray code conversion and vice versa using IC 7483.
4. MUX/DEMUX – use of IC 74153, IC 74149 for arithmetic circuits and code converter.
5. Realization of one/two bit comparator using logic gates and using 7485 IC (magnitude comparator).
6. Use of
   a. Decoder chip to drive LED display.
   b. Priority encoder.
7. Truth table verification of Flip flops
   a. JK Master slave
   b. T type
   c. D type
8. Realization of 3 bit counters as a sequential circuit and MOD-N counter design using IC 7476, IC 7490, IC 74192, IC 74193.
9. Shift left, shift right, SIPO, SISO, PISO, PIPO operations using IC 74S95.
10. Wiring and testing of Ring counter and Johnson counter using IC 7474 and IC 74S95.
Course Outcomes:
At the end of the course student will be able to
1. Simplify and realize Boolean expressions and perform code conversion operation using various digital IC
2. Design and test MUX/DEMUX using of IC 74153, IC 74139 for arithmetic circuits
3. Design and test one/two bit comparator using logic gates and using 7485 IC
4. Design and test Decoder chip to drive LED display and Priority encoder.
5. Verify the operation of JK Master slave, T type, D type flip flops and design counters and shift registers

Course Outcomes Mapping with Program Outcomes & PSO

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CORE COURSES – IV SEMESTER

PROBABILITY THEORY AND NUMERICAL METHODS

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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Teaching Department: Mathematics

Course Learning Objectives:
1. To study numerical methods to solve engineering problems where the analytical solutions for some functions are not possible.
2. To study different types of methods to solve ordinary differential equations.
3. To introduce numerical methods to solve partial differential equations.
4. To study one and two dimensional random variables for engineering problems.
5. To study different types of distributions for engineering problems.

UNIT – I

NUMERICAL METHODS-I
Numerical integration: General quadrature formula, Trapezoidal rule, Simpson's one third rule, Simpson's three eighth rule and Weddle's rule.

5*:+5 Hours
UNIT – II

NUMERICAL METHODS-II
Roots of algebraic and transcendental equations: Newton Raphson Method, Regula falsi Method


Numerical solution of partial differential equations: Classification, solution of Laplace and Poisson equations by standard five-point formulae, solution of heat and wave equations by explicit method. 11*+11 Hours

UNIT – III

PROBABILITY THEORY
Finite sample space, conditional probability and independence, Bayes' theorem (overview). One dimensional random variable: discrete and continuous random variable, probability functions, cumulative distribution function, expectation, and variance. Two-dimensional random variable, covariance, and correlation coefficient.

Distributions: Binomial, Poisson, Normal and exponential distributions. 10*+10 Hours

Course Outcomes:
At the end of the course student will be able to
1. Apply numerical methods to find solutions of algebraic equations.
2. Appreciate and apply different numerical methods to solve initial value problems.
3. Apply numerical methods to solve partial differential equations.
4. Illustrate the applications of two and higher dimensional random variables.
5. Understand different types of distributions for engineering problems.

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1: Low 2: Medium 3: High

SEE Question Paper Pattern:
- There will be 8 questions of 20 marks each in the question paper categorized into 3 Units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 1 full question from Unit - I and 2 full questions each from Unit – II&Unit – III.

TEXTBOOKS:
REFERENCE BOOKS:

E Books / MOOCs/ NPTEL
1. http://nptel.ac.in/courses/111105041/
2. http://nptel.ac.in/courses/111101004/
3. http://nptel.ac.in/courses/111105035/
4. http://nptel.ac.in/courses/111103021/
5. http://nptel.ac.in/downloads/122101003/
6. http://nptel.ac.in/courses/117101056/17
7. https://ocw.mit.edu/courses/mathematics/

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TRANSFORMERS AND INDUCTION MACHINES

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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Prerequisites: Basic Electrical Engineering (20EE104)

Course Learning Objectives:
1. To study the principle, types and analysis of the performance of single phase transformer.
2. To introduce the concept of testing the transformer for its efficiency and regulation.
3. To explain the construction, types, and analysis of the three phase induction machine.
4. To study various tests performed on an induction machine.
5. To know various starting and speed control methods of a three phase induction machine.
6. To introduce the theory and types of single phase induction machine.

UNIT – I


2*:0 Hours

Single phase transformers, analysis & performance: Ideal & practical transformers on no load, EMF equation, transformer on load vector diagrams, equivalent circuit, Losses, power & all day efficiency, Regulation, parallel operation, load sharing, Methods of cooling of transformer.

2*:4 Hours


Autotransformers: Principle of Autotransformers, Calculation of Saving of copper, Advantages/disadvantages.

3*:2 Hours
3 Phase transformers: operational aspects, 3 phase transformer connection including open delta, bank of 1 phase transformer for 3 phase operation, Scott connection for 3 phase -2phase conversion, Specification of commercial transformer, Tertiary winding and its importance.

UNIT – II

Three-phase Induction Machines: Operating principle, Concept of rotating magnetic field, Classification & types.


UNIT – III

Starting & control: Need for starter, DOL, Y-Δ autotransformer starting, speed control-voltage, frequency & rotor resistance variations (conventional).

Single phase induction motor:double field revolving theory, Principal of operation Types of I phase IM split phase, capacitor start.

Course Outcomes:
At the end of the course student will be able to
1. Illustrate the construction of single-phase transformer and tests to determine efficiency & regulation.
2. Describe the operation of autotransformers and analyze various three-phase transformer configurations.
3. Describe the constructional features and tests to obtain its equivalent circuit of three-phase Induction Machine.
4. Apply test data to determine performance parameters of an induction machine.
5. Summarize various starting & speed control methods of a three-phase induction motor and operating principle of various single-phase induction motor.

| Course Outcomes Mapping with Program Outcomes & PSO |
|---------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
|                              | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO |
|↓ Course Outcomes              |   |   |   |   |   |   |   |   |   |     |     |     |     |
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| 20EE402.3                      | 2 | 3 |   |   |   |   |   |   |   |     |   |   |     |
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| 20EE402.5                      | 2 | 3 |   |   |   |   |   |   |   |     |   | 2 |     |

1: Low 2: Medium 3: High
SEE Question Paper Pattern:
- There will be 8 questions of 20 marks each in the question paper categorized into 3 Units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 2 full questions each from Unit - I & Unit – II and 1 full question from Unit – III.

TEXTBOOKS:

REFERENCE BOOKS:
3. Kosow, Electrical Machines and Transformers, 2/e, PHI, 1990

E Books /MOOCs /NPTEL
1. NPTEL Course on Electrical Machines - I, Prof. Tapas Kumar Bhattacharya, IIT Kharagpur.
2. NPTEL Course on Electrical Machines - II, Prof. Tapas Kumar Bhattacharya, IIT Kharagpur.

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MICROCONTROLLER

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J – Project Based Learning executed as a part of Laboratory exercise.

Prerequisites: Logic Design (20EE305)

Course Learning Objectives:
1. To understand architectural features of microprocessor & microcontroller and addressing modes of 8051
2. To study the instruction sets and introduce 8051 programming.
3. To know working of interrupts, timers and serial communication principles
4. To understand interfacing of various peripherals to 8051 microcontroller.
5. To perform case studies on applications of 8051 microcontrollers

UNIT – I


The 8051 Architecture: Introduction, Architecture of 8051, Pin diagram of 8051, Memory organization, Stacks.
Addressing Modes: Introduction, Instruction syntax, Data types, Subroutines, Addressing modes: Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Absolute addressing, Long addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 5 Hours

UNIT – II

Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. 4 Hours

8051 programming: Assembler directives, Assembly language programs, C Programming, Time delay calculations. 6 Hours

UNIT – III

8051 Interrupts and Timers/counters: Basics of interrupts, 8051 interrupt structure, Timers and Counters, 8051 timers/counters, programming 8051 timers in assembly and C. 6 Hours

8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, connections to RS-232 (DB-9 only), Serial communication Programming in assembly and C. 6 Hours

UNIT – IV

8051 Interfacing and Applications: Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing, DC motor interfacing and PWM. 7 Hours

Interfacing LEDs, External memory. Seven segment modules, LED's interfacing. External memory interfacing. 5 Hours

UNIT – V


Course Outcomes:
At the end of the course student will be able to
1. Illustrate the basics of microcontrollers and outline the architecture, pin diagram, memory organization, different addressing modes of 8051 microcontroller.
2. List the instruction set to write assembly language and C Programs.
3. Apply the concepts of interrupts, timer/counter, and serial communication to develop a program for given application.
4. Apply the programming skills to interface external hardware units with 8051 microcontroller.
5. Design real world applications using 8051 microcontroller.
Course Outcomes Mapping with Program Outcomes & PSO

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SEE QUESTION PAPER PATTERN:
- There will be 10 questions of 20 marks each in the question paper categorized into 5 units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting one full question from each unit.

TEXTBOOKS:

REFERENCE BOOKS:

E Books /MOOC/NPTEL
1. NPTEL course on Microprocessors and Microcontrollers, Prof. Santanu Chattopadhyay, IIT Kharagpur
2. An Introduction to Programming the Internet of Things (IOT) Specialization on Coursera

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ELECTRO MAGNETIC FIELDS

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*Note: Lecture hours indicated are for teaching theoretical concepts. Illustrative examples and numerical problems are to be worked out in tutorial classes.

Prerequisites: Basic Electrical Engineering (20EE104)

Course Learning Objectives:
1. To study different coordinate systems for understanding the concept of gradient, divergence and curl of a vector.
2. To study the application of Coulomb’s Law and Gauss Law for electric fields produced by different charge configurations.
3. To evaluate the energy and potential due to a system of charges.
4. To study the behavior of electric field across a boundary between a conductor and dielectric and between two different dielectrics.
5. To study the magnetic fields and magnetic materials.
6. To study the time varying fields and propagation of waves in different media.

UNIT – I

Coulomb’s Law and Electric field intensity: Experimental law of coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge.

4*+2 Hours

Electric flux density, Gauss’s law and Divergence: Electric flux density, Gauss’s law and Divergence, Vector operator $\nabla$ and Divergence theorem.

4*+3 Hours

UNIT – II

Energy and Potential: Energy expanded in moving a point charge in an electric field, the line integral, Definition of Potential difference and Potential, the potential field of a point charge and system of charges, Potential gradient, Energy density in an Electrostatic field.

4*+3 Hours

Conductors, dielectrics and capacitance: Current and current density, Continuity of current, Metallic Conductors, Conductor properties and boundary conditions, Nature of Dielectric Materials, Boundary conditions for perfect dielectrics, capacitance and examples.

4*+2 Hours

UNIT – III

Poisson's and Laplace's equations: Derivation of Poisson’s and Laplace’s equations. Examples of the solutions of Laplace’s and Poisson’s equation.

2*+2 Hours

The steady magnetic field: Biot – Savart’s law, Ampere’s circuitual law, curl, Stokes theorem, Magnetic flux and magnetic flux density, Scalar and vector magnetic potentials.

6*+3 Hours
UNIT – IV

Magnetic forces, Magnetic Materials and Inductance: Force on a moving charge, Magnetic boundary conditions, Inductance.  
4*+3 Hours

Time varying fields and Maxwell’s equations: Faraday’s law, Displacement current, Maxwell’s equation in point and integral form.  
4*+2 Hours

UNIT – V

4*+3 Hours

Uniform plane wave: Wave propagation in free space and dielectrics, Poynting’s theorem and wave power, propagation in good conductors – skin effect.  
4*+2 Hours

Course Outcomes:
At the end of the course student will be able to
1. State and apply the Coulomb’s, Gauss’s Law to determine the electric field intensity resulting from various charge distributions.
2. Describe the electric potential to compute electric field intensity and analyze the boundary conditions for various interfaces to understand the variation in electric filed intensity.
3. Apply Poisson’s and Laplace’s equations to calculate capacitance of various geometrics and apply Biot- Savart’s, Ampere’s Law to compute magnetic field intensity.
4. Apply the concept of magnetic forces, boundary conditions and Maxwell’s equations to determine inductance and parameters of time varying fields.
5. Describe plane wave reflection and transmission at the boundaries to study the wave propagation and skin effect.

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1: Low 2: Medium 3: High

SEE QUESTION PAPER PATTERN:
- There will be 10 questions of 20 marks each in the question paper categorized into 5 units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting one full question from each unit.

TEXTBOOK:
REFERENCE BOOKS:
2. Elements of Electromagnetics, Matthew N. O. Sadiku, OUP USA

E Book /MOOC / NPTEL:
1. NPTEL on Applied Electromagnetics For Engineers, Prof. Pradeep Kumar, IIT Kanpur
3. http://nptel.ac.in/courses/108104087/

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ELECTRICAL POWER GENERATION AND ECONOMICS

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*Self-Study Topics – To be covered under the supervision of the course instructors.
Prerequisites: BEE (20EE104)

Course Learning Objectives:
1. Describe the working of hydroelectric plants
2. Describe the working of steam power plant
3. Explain the advantages and working of nuclear power plant
4. Classify different types of tariff and methods of power factor improvement
5. Understand the economic aspects of power system operation and its effects

UNIT – I

Hydroelectric Power Plants: Hydrology, Run off and stream flow, Hydrograph, Flow duration curve, Mass curve, Reservoir capacity, Dam storage. Hydrological cycle, Merits and demerits of hydroelectric power plants, Selection of site. General layout of hydel plant, Elements of the plant, Classification of the plants based on water flow regulation, Water head Water turbines – Pelton wheel, Francis, Kaplan and propeller turbines. Selection of water turbines. Underground, Small hydro and pumped storage plants. concept of co-generation, concept of distributed generation 9 Hours

Steam Power Plants: Introduction, Efficiency of steam plants, Merits and demerits of plants, Selection of site. Working of steam plant, Power plant equipment and layout, Steam turbines, Fuels and fuel handling, Ash handling, Dust collection, Draught systems, Feed water, Methods of improving thermal efficiency of a simple steam power plant 6 Hours

UNIT – II

Nuclear Power Plants: Introduction, Merits and demerits, selection of site, Nuclear reaction, Nuclear fission process, chain reaction, Nuclear energy, Nuclear fuels, Nuclear
plant layout, Nuclear reactor and its control, Classification of reactors, Power reactors in use, Effects of nuclear plants, Disposal of nuclear waste and effluent, Shielding 4 Hours

**Diesel Power Plant:** Introduction, Merits and demerits, Selection site, Elements of diesel power plant, Applications, Comparison of gas power plant with steam and diesel power plants.

**Gas Turbine Power Plant:** Introduction Merits and demerits, Selection site, Fuels for gas turbines, Elements of simple gas turbine power plant, Closed cycle gas turbine power plants. 3 Hours

**Introduction to renewable energy systems** - site selection, block diagrams, components-solar, wind 3 Hours

**Power factor improvement:** power factor, power triangle disadvantages of load power factor, causes of low power factor, power factor improvement, power factor improvement equipment, calculations of power factor correction, importance of power factor improvement, most economical power factor, meeting the increased kW demand on power station 5 Hours

**UNIT – III**

**Economic Aspects:** Introduction, Terms commonly used in system operation, diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor, loss factor, load duration curve, energy load curve, interconnection of power station, Effect of variable load on power system, classification of costs, cost analysis. Interest and Depreciation, Tariffs, objective, factors affecting the tariff, types. Types of consumers and their tariff. 6 Hours

**Economics of power generation:** Cost of electrical energy, expression for cost of electrical energy, methods of determining depreciation, importance of high load factor 3 Hours

**Course Outcomes:**
At the end of the course student will be able to
1. Describe the operation of hydroelectric plants to acquaint knowledge on different types of hydel plants
2. Describe the working of steam power plant on different operating stages and safety precautions
3. Illustrate the functioning of nuclear power plant and state functions of major equipment of the power plants
4. Describe the effect of low power factor and compute desired kVAR rating for power factor improvement.
5. Analyze the economic aspects of power generation and suggest a suitable tariff for consumers.

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1: Low 2: Medium 3: High
SEE Question Paper Pattern:
- There will be 8 questions of 20 marks each in the question paper categorized into 3 Units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 2 full questions each from Unit - I & Unit – II and 1 full question from Unit – III.

TEXTBOOKS:

REFERENCE BOOKS:

E-Books / MOOC:
1. Energy scenario: https://beeindia.gov.in/sites/default/files/1Ch1.pdf
3. https://www.coursera.org/learn/electric-utilities

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Prerequisites: BEE (20EE104)

Course Learning Objectives:
1. Explain the importance of high voltage transmission, understand different types of conductors and calculate sag of a transmission line.
2. Understand the methods for OH Line protection against lightning and calculate the string Efficiency of Line insulators.
3. Calculate the parameters of the transmission line for different configurations.
4. Assess the performance of transmission line.
5. Explain the use of underground cables and evaluate different types of distribution systems.

UNIT – I

Typical transmission & distribution systems scheme: General layout of power system, Standard voltages for transmission: HVAC, EHVAC, UHVAC, and Advantage of high voltage transmission. Feeders, distributors & service mains. 3 Hours

Overhead transmission lines: A brief introduction to types of supporting structures.
Types of transmission line conductors: Aluminum Conductor steel reinforced (ACSR), All –aluminum alloy conductor (AAAC) and All –aluminum conductor (AAC). High temperature conductors; Thermal resistant aluminum alloy (ATI), Super thermal resistant aluminum alloy (ZTAI), Gap type thermal resistant aluminum alloy conductor steel reinforced (GTACSR), Gap type super thermal resistant aluminum alloy conductor steel reinforced (GZTACSR), Arial Bunch Conductor(ABC). Overhead line protection against lightening; ground wires.

Sag calculation in conductors: a) suspended on level supports b) support at different levels. Effect of wind & ice tension & sag at erection, line vibration damper.

Insulators: Types, Material used: porcelain, toughened glass and polymer (composite), potential distribution over a string of suspension insulators. String efficiency & methods of increasing strings efficiency, Arcing horns. Testing of insulators.

UNIT – II

Line parameters: calculation of inductance of single phase, 3phase lines with equilateral & unsymmetrical spacing. Inductance of composite conductor lines (GMR and GMD), capacitance calculation for single circuit and double circuit three-phase line with equilateral & unsymmetrical spacing, Bundle conductor and its advantages, Double circuit and transposed lines, Advantages of single circuit and double circuit lines.

Characteristics & performance of power transmission lines: Classification of lines, Transmission line model for Short transmission lines, medium transmission lines- nominal T, end condenser and pi models, long transmission lines , line regulation. Ferranti effect, ABCD constants of transmission lines

Corona: Phenomena, Methods of reducing corona

UNIT – III

Underground cables: Types of cables, Constructional features, material used, insulation resistance, thermal rating of cables, charging current, Grading of cables, capacitance grading, Inter sheath grading. Limitations of cables.

Distribution: Requirements of power distribution, ac distribution - radial & ring main systems, calculation for concentrated loads.

Introduction to HVDC transmission and FACTS, Application of HVDC and FACTS

Course Outcomes:
At the end of the course student will be able to
1. Describe the transmission and distribution schemes to identify the importance of different types of supports, conductors and protection against lightning.
2. Analyze the factors effecting the sag and string efficiency of a transmission line to understand the design process of mechanical and electrical aspects of transmission lines.
3. Analyze the different overhead line configurations to compute the transmission line parameters.
4. Apply the line parameters to evaluate the performance of transmission line.
5. Describe the construction of underground cables and distribution systems to determine voltage profile at different locations of feeder & distributor.
### Course Outcomes Mapping with Program Outcomes & PSO

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1: Low 2: Medium 3: High

### SEE Question Paper Pattern:
- There will be 8 questions of 20 marks each in the question paper categorized into 3 Units as per the syllabi & contact hours. The student will have to answer 5 full questions, selecting 2 full questions each from Unit - I & Unit – II and 1 full question from Unit – III.

### TEXTBOOKS:

### REFERENCE BOOKS:
4. Ashfaq Hussain, Electrical power systems, CBS Publication

### E-Books / MOOC:
1. Energy scenario : https://beeindia.gov.in/sites/default/files/1Ch1.pdf
3. https://www.coursera.org/learn/electric-utilities

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DC AND SYNCHRONOUS MACHINES LABORATORY

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**Course Learning Objectives:**
1. To perform test on DC Machine to determine the speed torque characteristics, BHP, efficiency.
2. To perform the Speed control experiments on DC Machines
3. To perform various tests on DC and synchronous machines.
4. To test the alternator for its voltage regulation.
5. To test the synchronous machines to draw V and inverted V curves.

**List of Experiments**
1. Load test on DC Motor-Determination of speed torque and BHP efficiency characteristics
2. Speed control of DC motors by Armature Voltage and Flux control methods.
3. Swinburne’s Test
4. Hopkinson’s Test
5. Field test on series motors
6. Retardation test-Electrical braking method
7. Voltage Regulation of Alternator by EMF and MMF method
8. Voltage regulation of alternator by ZPF method
9. Slip test
10. V and inverted V curves of a synchronous motor

**Course Outcomes:**
At the end of the course student will be able to
1. Draw speed torque characteristics and determine BHP & efficiency of DC Machine.
2. Apply control schemes to control the speed of DC machines
3. Perform suitable test on DC machine to determine the efficiency.
4. Apply EMF/MMF/ZPF method to predetermine voltage regulation of alternators
5. Control the excitation of synchronous machines to control reactive power and draw V & inverted V curves.

**Course Outcomes Mapping with Program Outcomes & PSO**

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MICROCONTROLLER LABORATORY

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**Course Learning Objectives:**
1. To introduce addressing mode, applications of logical, arithmetic and loop instructions
2. To develop C program for interfacing various display units with 8051
3. To write program to interface signal processing units
4. To write program to interface motor control units
5. To write program to interfacing serial communication

**List of Experiments**
1. Demonstration of various addressing modes
2. Applications of logical and arithmetic instructions
3. Applications of branch and loop instructions
4. Embedded C programming to interface LEDs and Buzzer
5. Embedded C programming to interface Switch and Seven Segment Display
6. Embedded C programming to interface Hex Keypad with Seven Segment Display
7. Embedded C programming to interface LCD
8. Embedded C programming to interface ADC
9. Application of serial communication for debugging and interfacing of relay
10. AC Voltage Measurement: Project demonstration by students
11. Demonstration of interfacing DAC
12. Demonstration of interfacing DC and Stepper motor

**Course Outcomes:**
At the end of the course student will be able to
1. Write embedded C code to validate logical, arithmetic and loop instructions
2. Develop embedded C code to display the values in LED array, Seven segment and LCD
3. Implement embedded C code to process data using ADC and DAC
4. Develop embedded C code to achieve stepper and DC motor speed control
5. Develop embedded C code to communicate between PC and controller over serial interface

**Course Outcomes Mapping with Program Outcomes & PSO**

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1: Low 2: Medium 3: High
REFERENCE BOOK:
1. Micro-LABlet Hardware and Software Design Documents, Version_0D, Department of E&E, NMAMIT, Nitte, 2016

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Pre-requisites:
Students must have essential knowledge of English Language Communication.

Course Learning Objectives (CLO):
By the end of the course, students should be able to:
1. Introspect and learn about oneself.
2. Develop professional writing skills.
3. Acquaint with the various social behaviour and etiquette.
4. Apply the techniques of fundamental communication skills.
5. Develop necessary techniques for formal presentations and be acquainted with cultural diversities & issues related to gender sensitivity.

UNIT – I

Personality Traits:
Types & Kinds of personality, Ways to Identify Self (Entry - Exit survey- Tests; SWOT Analysis, Johari Window).

UNIT – II

Effective Communication Skills:
One-way and two-way Communication (Square activities), Active listening, Speaking.

UNIT – III

Writing Skills:
Formal E-mails, Framing Requests, Greetings, Salutations, Close

UNIT – IV

Social Behavior and Etiquette:
Time Management, Personal Grooming, Hygiene, Dressing for different occasions, Making Small Talk, Showing Respect, Feedback

UNIT – V

Professional Presentation Techniques:
Group discussion, Formal Presentation, Awareness of the cultural diversity of the workplace, the global work cultures, Introduction to Gender Sensitivity
Course Outcomes (CO):
By the end of the course, students will be able to:
CO1 - Understand the importance of human conduct.
CO2 - Demonstrate knowledge of theory and competence in office communication.
CO3 - Develop and assess various types of communication.
CO4 - Be Familiar with the current practices of social behaviour.
CO5 - Prepare and deliver presentation appropriate for the workplace.

Course Outcomes Mapping with Program Outcomes & PSO

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REFERENCE BOOKS:

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## Syllabus

**B.E. / Electrical & Electronics Engineering**

### Syllabus for III & IV Semester (for Kannadigas)

*Common to all branches to be offered either in III or IV Semester*

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### Kannada Language Objectives

- Discuss the importance of software tools in the field of Kannada language.
- Integrate the knowledge of Kannada language in various software applications.
- Analyze the role of software tools in the preservation and promotion of Kannada language.
- Evaluate the effectiveness of software tools in solving problems related to Kannada language.
- Design and implement software tools for Kannada language.
- Test and validate the developed software tools.
- Document the developed software tools.
- Deploy the software tools in real-world applications.
- Perform maintenance and support for the developed software tools.

### Kannada Language Course Outline

- **Course Introduction**: Kannada language - its history, evolution, and significance.
- **Kannada Language Development**: Development of software tools for Kannada language.
- **Kannada Language Applications**: Applications of software tools in various fields.
- **Kannada Language Tools**: Overview of existing software tools for Kannada language.
- **Kannada Language Challenges**: Challenges in developing software tools for Kannada language.
- **Kannada Language Research**: Research topics in developing software tools for Kannada language.
- **Kannada Language Tools Design**: Design and implementation of software tools for Kannada language.
- **Kannada Language Tools Testing**: Testing and validation of software tools for Kannada language.
- **Kannada Language Tools Documentation**: Documentation of software tools for Kannada language.
- **Kannada Language Tools Deployment**: Deployment of software tools for Kannada language.
- **Kannada Language Tools Maintenance**: Maintenance and support of software tools for Kannada language.

### Kannada Language Course Syllabus

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<th>Course Title</th>
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<td>2</td>
<td>Kannada Language Development</td>
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<td>4</td>
<td>Overview of Existing Kannada Tools</td>
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<td>5</td>
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<td>Research Topics in Developing Kannada Tools</td>
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<td>7</td>
<td>Design and Implementation of Kannada Tools</td>
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<td>Testing and Validation of Kannada Tools</td>
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<td>Documentation of Kannada Tools</td>
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<td>10</td>
<td>Deployment of Kannada Tools</td>
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### Kannada Language Course Assessment

- **Continuous Assessment**: 30%
- **Final Exam**: 70%
Course Learning Objectives:
The course will enable the students to understand Kannada and communicate in Kannada language.

Chapter – 1: Vyavaharika Kannada – Parichaya (Introduction to Vyavaharika Kannada)
Chapter – 2: Kannada Aksharamalehaaguuchcharane (Kannada Alphabets and Pronunciation)
Chapter – 3: Sambhashanegaagi Kannada Padagalu (Kannada Vocabulary for Communication)
Chapter – 4: Kannada Grammar in Conversations (Sambhashaneyalli Kannada Vyakarana)
Chapter – 5: Activities in Kannada.