

|| Jai Sri Gurudev ||
Sri Adichunchanagiri Shikshana Trust (R)

SJB Institute of Technology

An AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

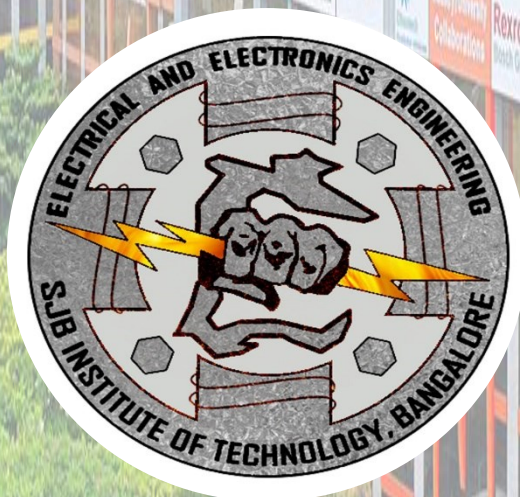


Approved by AICTE, 2(f) and 12(B) recognized by UGC, New Delhi
Accredited by NAAC, Accredited by NBA, Certified by ISO 9001 - 2015



BACHELOR OF ENGINEERING [B.E.]

Electrical & Electronics Engineering



AUTONOMOUS SCHEME & SYLLABUS

SECOND YEAR
III & IV SEMESTER
2023 SCHEME



SERVICE TO MANKIND IS SERVICE TO GOD

His Divine Soul Padmabhushana

Sri Sri Sri Dr. Balagangadharanath MahaSwamiji

Founder President, Sri Adichunchanagiri Shikshana Trust®



Belief in God is not ignorance or illusion. It is a belief that there is an unseen, ineffable Power that transcends all our powers of muscles, mind and lives.



His Holiness Parama Pujya

Sri Sri Sri Dr. Nirmalanandanatha MahaSwamiji

President, Sri Adichunchanagiri Shikshana Trust ®

True richness is the generosity of heart. Cultivate it and work to help the less fortunate ones in life.

Revered Sri Sri Dr. Prakashanatha Swamiji

Managing Director, BGS & SJB Group of Institutions & Hospitals



People and prosperity follow the path which the leaders take. So the elders and leaders should make sure that they give the right lead and take the right path.



SJB INSTITUTE OF TECHNOLOGY



AN AUTONOMOUS INSTITUTION UNDER VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Department of Electrical and Electronics Engineering



Vision and Mission



Department Vision

To become one among the best departments in engineering and research arena through professional faculty and state of art laboratories and to make the students successful engineers with good ethics.

Department Mission

1

M1: To provide learner-centric environment through quality education and training.

2

M2: To lay the foundation for research by fortifying peers & establishing incubation center.

3

M3: To develop the overall personality of the students to face the challenges of the real world.

2023 Scheme – UG

Syllabus for 3rd & 4th Semester

The syllabus, scheme and guidelines are provided in detail.
The syllabus, scheme and guidelines are subjected to changes if any needed.
The updates will be done timely.
Regularly access the institution website for the updated information.

The Syllabus book is available on www.sjbit.edu.in

For any queries, please write to academicdean@sjbit.edu.in

UPDATES

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SJB Institute of Technology

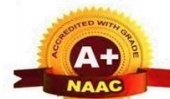
BGS Health and Education City, Dr. Vishnuvardhana Road, Kengeri, Bengaluru-560060

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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 2nd Year EEE

SCHEME: 2023

SEM: III

Revision date:24/08/2024

| S. # | Course Type | Course type Series | Course Code | Course Title | Teaching Dept. | QP setting dept | Credits | Teaching Hrs/Week | | | | Examinations | | | | |
|-------|-------------|--------------------|-------------|---|----------------|-----------------|---------|-------------------|----------|-----------|-------------------|--------------|--------------------|-----|-----|------|
| | | | | | | | | L | T | P | O | CIE Marks | SEE (Dur. & Marks) | | | |
| | | | | | | | | Lecture | Tutorial | Practical | PBL/ABL / SL/etc. | | Dur. | Th. | Lab | Tot. |
| 1 | IBSC | 3 | 23EEI301 | Transforms and Statistics | Maths | Maths | 4 | 2 | 2 | 2 | @ | 50 | 03 | 50 | - | 100 |
| 2 | PCC | 1 | 23EET302 | Transformers and Generators | EE | EE | 3 | 2 | 2 | 0 | @ | 50 | 03 | 50 | - | 100 |
| 3 | IPCC | 1 | 23EEI303 | Electric Circuit Analysis | EE | EE | 4 | 3 | 0 | 2 | | 50 | 03 | 50 | - | 100 |
| 4 | IPCC | 2 | 23EEI304 | Analog & Digital Circuits | EE | EE | 4 | 2 | 2 | 2 | @ | 50 | 03 | 50 | - | 100 |
| 5 | PCCL | 1 | 23EEL305 | Electrical Machines lab 1 | EE | EE | 1 | 0 | 0 | 2 | | 50 | 03 | - | 50 | 100 |
| 6 | ETC | 1 | 23EEE31y | Emerging Technology Course - 1 | EE | EE | 3 | 3 | 0 | 0 | @ | 50 | 03 | 50 | - | 100 |
| 7 | AEC | 3 | 23EEAE31 | Troubleshooting on Electrical appliances, Wiring and Auto CAD | I.E. | I.E. | 1 | 1 | 0 | 0 | 3 | 50 | 02 | 50 | - | 100 |
| 8 | NCMC | 3 | 23PDSN03 | Skilful futures: Empowering Aptitude and Soft skills | I.E. | I.E. | PP/NP | 0 | 0 | 0 | 2 | 50 | - | - | - | 50 |
| 9 | NCMC | 4 | 23PASN01 | Physical Education - Sports and Athletics | PED | PED | PP/NP | | | | 2 | 50 | - | - | - | 50 |
| | | | 23YOGN02 | Yoga | PED | PED | | | | | | | | | | |
| | | | 23NSSN03 | NSS - National Service Scheme | NSS | NSS | | | | | | | | | | |
| | | | 23NCCN04 | NCC - National Cadet Corps | NCC | NCC | | | | | | | | | | |
| | | | 23IKSN05 | Indian Knowledge System | HSS | HSS | | | | | | | | | | |
| Total | | | | | | | 20 | 13 | 6 | 8 | 7 | 450 | | 300 | 50 | 800 |

BSC: Basic Science Course; PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course; {I.E.-Industry Experts};

{ @ - Compulsory one activity }.

PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be planned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

NCMC (Non Credit Mandatory Course): The following guidelines are applicable for the course type series-4 as mentioned above.

- 1) All students must register for any one of the course with the department during the first week of the III semester.
- 2) Once registered for a course in the III semester, the student shall continue and complete the same course in the remaining semesters. No provision for changing the courses after registration.
- 3) Activities shall be carried out by the students between III semester to VI semester (for 4 semesters).
- 4) The activities shall be organized, executed and monitored by the concerned department as mentioned above in coordination with the department level course coordinators. The same shall be reflected in the calendar of events of the above concerned departments.
- 5) Successful completion of the registered course and requisite CIE score (PP) is mandatory for the award of degree.
- 6) These courses are not considered for vertical progression, calculation of SGPA & CGPA, however it is mandatory for the award of degree.
- 7) The guidelines is applicable to all the remaining IV to VI semesters.

Additional courses for Lateral Entry students:

- 1) The lateral entry students getting admitted from the 2nd year of programme, shall register, study and complete additional courses prescribed & offered time to time.
- 2) Successful completion of the registered course and requisite CIE score (PP) is mandatory for the award of degree.
- 3) These courses are not considered for vertical progression, calculation of SGPA & CGPA, however it is mandatory for the award of degree.

Self-Learning Courses (SLC) as per the VIII Semester ST&E:

- 1) Offering and Registration of Self-learning Courses will commence from 3rd Semester itself and continues till the end of the duration of study.
- 2) Both regular & lateral entry students shall start registering for the self learning courses and complete as per the guidelines published separately. (Refer to the Self Learning Courses guidelines published).
- 3) These courses are not considered for vertical progression.
- 4) Calculation of SGPA & CGPA is considered for VIII Semester, irrespective of period or time of completion of the course.

| Emerging Technology Course - 1 | |
|--------------------------------|--|
| Course Code | Course Title |
| 23EEE311 | Modern Measurements and Instrumentation |
| 23EEE312 | Introduction to Solar Photovoltaic systems |
| 23EEE313 | Micro & Nano Scale Sensors & Transducers |
| 23EEE314 | Programming in C++ |



AUTONOMOUS SCHEME (Tentative) UG - BE 2nd Year

SCHEME: 2023

Date of release: 29/06/2024

SEM: III

Additional courses for Lateral Entry students

Note:

- 1) For the fulfillment of successful completion of degree, lateral entry students, shall study & complete additional courses as per the guidelines released time to time.
- 2) Regular courses (SL No 1 to 8) are same as applicable to all defined in the scheme of teaching & examinations (ST&E).
- 3) The below prescribed courses has to be registered whenever they are offered and successfully completed before the end of Seventh Semester End Examinations.

| SL No | Course Type | Course type Count | Course Code | Course Title | Teaching Dept. | QP setting dept | Credits | Teaching Hrs/Week | | | | Examinations | | | | |
|-------|-------------|-------------------|-------------|--------------|----------------|-----------------|---------|-------------------|----------|-----------|------------------------|--------------|------|----------|------------|------------|
| | | | | | | | | L | T | P | O | CIE Marks | SEE | | | Tot. Marks |
| | | | | | | | | Lecture | Tutorial | Practical | PBL/ABL/ SL/others. | | Dur. | Th. Mrks | Lab. Mrks. | |

For CS stream (CSE/ISE/AIIML/CSE(DS))

| | | | | | | | | | | | | | | | | |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|
| 9 | BSC | - | 23MAT31A | Additional mathematics-1 | Maths | Maths | PP/NP | 2 | 0 | 0 | @ | 50 | - | - | - | 50 |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|

For EE stream (ECE & EEE)

| | | | | | | | | | | | | | | | | |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|
| 9 | BSC | - | 23MAT31B | Additional mathematics-1 | Maths | Maths | PP/NP | 2 | 0 | 0 | @ | 50 | - | - | - | 50 |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|

For CV stream (Civil)

| | | | | | | | | | | | | | | | | |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|
| 9 | BSC | - | 23MAT31C | Additional mathematics-1 | Maths | Maths | PP/NP | 2 | 0 | 0 | @ | 50 | - | - | - | 50 |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|

For ME stream (Mechanical)

| | | | | | | | | | | | | | | | | |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|
| 9 | BSC | - | 23MAT31D | Additional mathematics-1 | Maths | Maths | PP/NP | 2 | 0 | 0 | @ | 50 | - | - | - | 50 |
|---|-----|---|----------|--------------------------|-------|-------|-------|---|---|---|---|----|---|---|---|----|



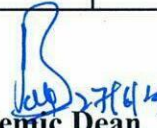
Self Learning course list for UG BE - 2026-27

SCHEME: 2023

Release date:25/06/2024

| Self-Learning course - 1 (NPTEL) | | | Self-Learning course - 2 (NPTEL) | | |
|----------------------------------|--|-------------|----------------------------------|--|-------------|
| Course Code | Course Title | NPTEL Code | Course Code | Course Title | NPTEL Code |
| 23EES101 | An Introduction To Coding Theory | noc23-ee101 | 23EES201 | Understanding Incubation And Entrepreneurship | noc23-de16 |
| 23EES102 | Machine Learning And Deep Learning - Fundamentals And Applications | noc23-ee87 | 23EES202 | Learning Analytics Tools | noc23-ge42 |
| 23EES103 | Electrical Equipment And Machines: Finite Element Analysis | noc23-ee104 | 23EES203 | Economics of IPR | noc24-hs92 |
| 23EES104 | Design Of Photovoltaic Systems | noc23-ee107 | 23EES204 | Deep Learning - IIT Ropar | noc23-cs110 |
| 23EES105 | Electronic Systems For Cancer Diagnosis | noc23-ee110 | 23EES205 | Big Data Computing | noc23-cs112 |
| 23EES106 | Pattern Recognition And Application | noc23-ee119 | 23EES206 | Privacy And Security In Online Social Media | noc23-cs69 |
| 23EES107 | Dc Microgrid And Control Systems | noc23-ee123 | 23EES207 | Artificial Intelligence : Search Methods For Problem Solving | noc23-cs92 |
| 23EES108 | Applied Optimization For Wireless, Machine Learning, Big Data | noc23-ee99 | 23EES208 | Cyber Security and Privacy | noc23-cs127 |
| 23EES109 | Mathematical Aspects Of Biomedical Electronic System Design | noc23-ee90 | 23EES209 | Entrepreneurship And IP Strategy | noc23-hs144 |
| 23EES110 | Introductory Neuroscience & Neuro-Instrumentation | noc23-ee89 | 23EES210 | Patent Law For Engineers And Scientists | noc23-hs97 |


HOD


Academic Dean


Principal

HOD
Dept. of EEE
SJB Institute of Technology
BGS Health & Education City
Kengeri, Bengaluru-560060

Dr. BABU. N.V
Prof. & Academic Dean
SJB Institute of Technology
BGS Health & Education City
Kengeri, Bengaluru-560060

Principal
SJB Institute of Technology
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Guidelines for Self-learning courses – Under Graduation (UG)

- 1) As per the Scheme of Teaching & Examinations (ST&E) the UG students to earn totally 06 credits by studying and completing 02 NPTEL/SWAYAM courses of 12 weeks each earning 03 credits.
- 2) The credits so earned by successful completion of the courses will be credited in the 8th SEM grade card.
- 3) The successful completion of the courses means earning of the course completion certificates from NPTEL/SWAYAM.
- 4) The courses shall be studied and completed starting from 3rd Semester and shall be completed before the announcement of 8th Semester End Examinations. However, it is advised to complete both the courses before the 7th SEM of their graduation.
- 5) The respective department BOS shall identify the professional courses related to the respective discipline either core or multidisciplinary from the list of courses released by NPTEL/SWAYAM every season. At least ten such courses shall be identified and finalized after the discussions in the respective BOS meetings, and the list shall be approved by the Academic Dean.
- 6) The approved list shall be published by the departments to the students at the beginning of the 3rd SEM itself and the student shall be given an option to choose up to 02 courses for the study and earn certificates of completion.
- 7) The practicing of studying and completion of NPTEL/SWAYAM courses starting from 3rd SEM itself has multi-fold effect:
 - i) Enhances the self-learning ability of the students.
 - ii) Study of self-learning courses will have impact on the learning of other courses in the scheme of teaching & examinations.
 - iii) Will address the real time challenges/difficulties/differences in the calendars of NPTEL/SWAYAM & Institution.
- 8) The respective departments shall make holistic efforts to bring awareness to the students about the objectives and importance of self-learning courses. The departments shall thrive towards fulfilment of the objectives.
- 9) The departments shall continuously monitor & track the progress of the accomplishment of the courses by the students.
- 10) The departments shall assign course mentors as per the guidelines of the NPTEL/SWAYAM.

- 11) The departments shall take care that the registered courses and the examinations shall be under the local chapter of the Institution.
- 12) Every care must be taken by the departments to guide, motivate, to help the students in completing the courses as the academic calendar of the institution and the calendar of the NPTEL/SWAYAM does not match. The faculty advisory system or Mentor System must play a significant role.
- 13) Every season new courses may be added to the identified list and a fresh list of courses shall be prepared based on the list announced by the NPTEL/SWAYAM every season. However, the courses published from the first list shall be maintained if the NPTEL/SWAYAM list has the courses.
- 14) If the students are unable to successfully complete the course, they shall be given an option to re-register for the same course multiple times if the courses are available during the respective seasons in NPTEL/SWAYAM list.
- 15) An option for making fresh choice shall be given to the students until the successful completion of the courses and earning of required number of credits within the defined time.
- 16) The list of students registered for the courses and completion of the courses shall be submitted to the dean office on completion of every season.
- 17) All the regulations such as "Dropping of courses", "Withdrawal of Courses", etc. as described in the academic regulations shall be applicable to the Self Learning Courses (SLC).
- 18) The performance of the students in the assignments and the certification exam of the NPTEL/SWAYAM shall be considered for awarding the grade points to the students in the self-learning courses.
- 19) If the students are successfully completing more than the prescribed number of courses in their period of study, best performed courses (group wise) may be considered for the award of credits.
- 20) The CIE & SEE marks as prescribed in the Scheme of Teaching & Examinations (ST&E) shall be considered as per the performance of the student in the successfully completed NPTEL/SWAYAM course. The obtained assignment marks in the successfully completed NPTEL/SWAYAM course shall be mapped to the CIE and obtained exam certification percentage in the successfully completed NPTEL/SWAYAM course shall be mapped for SEE marks.
- 21) The students unable to complete the self-learning courses and earn the required credits will not be awarded the degree. Degree shall be awarded only after successful completion and earning of credits.


Academic Dean
Dr. Babu N V


Principal
Dr. K V Mahendra Prashanth



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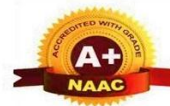
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Autonomous Scheme of Teaching & Examinations (ST&E) (Tentative) UG - BE 2nd Year EEE

SCHEME: 2023

SEM: IV

Revision date:24/08/2024

| S. # | Course Type | Course type Series | Course Code | Course Title | Teaching Dept. | QP setting dept | Credits | Teaching Hrs/Week | | | | Examinations | | | | |
|-------|-------------|--------------------|-----------------------|--|----------------|-----------------|---------|-------------------|----------|-----------|-------------------|--------------|--------------------|-----|-----|------|
| | | | | | | | | L | T | P | O | CIE Marks | SEE (Dur. & Marks) | | | |
| | | | | | | | | Lecture | Tutorial | Practical | PBL/AB L/ SL/etc. | | Dur. | Th. | Lab | Tot. |
| 1 | BSC | 4 | 23EET401 | Probability Distributions and Linear Algebra | Maths | Maths | 3 | 2 | 2 | 0 | @ | 50 | 03 | 50 | - | 100 |
| 2 | PCC | 2 | 23EET402 | Electric Motors | EE | EE | 3 | 3 | 0 | 0 | @ | 50 | 03 | 50 | - | 100 |
| 3 | IPCC | 3 | 23EEI403 | Microcontrollers | EE | EE | 4 | 3 | 0 | 2 | | 50 | 03 | 50 | - | 100 |
| 4 | IPCC | 4 | 23EEI404 | Transmission & Distribution | EE | EE | 4 | 3 | 0 | 2 | | 50 | 03 | 50 | - | 100 |
| 5 | PCCL | 2 | 23EEL405 | Electrical Machines lab 2 | EE | EE | 1 | 0 | 0 | 2 | | 50 | 03 | - | 50 | 100 |
| 6 | ETC | 2 | 23EEE42y | Emerging Technology Course - 2 | EE | EE | 3 | 3 | 0 | 0 | @ | 50 | 03 | 50 | - | 100 |
| 7 | HSMC | 5 | 23SFHH06/ 23UHVH07 | Bioscience (or) UHV - Universal Human Values | any dept | any dept | 1 | 0 | 2 | 0 | @ | 50 | 02 | 50 | - | 100 |
| 8 | AEC | 4 | 23EEAE41 | Network Security | I.E. | I.E. | 1 | 1 | 0 | 0 | 3 | 50 | 02 | 50 | - | 100 |
| 9 | NCMC | 5 | 23PDSN04 | Mindful Mastery: Aptitude and soft skill integration | I.E. | I.E. | PP/NP | 0 | 0 | 0 | 2 | 50 | - | - | - | 50 |
| 10 | NCMC | 4 | 23PASN01 | Physical Education - Sports and Athletics | PED | PED | PP/NP | | | | 2 | 50 | | | | 50 |
| | | | 23YOGN02 | Yoga | PED | PED | | | | | | | | | | |
| | | | 23NSSN03 | NSS - National Service Scheme | NSS | NSS | | | | | | | | | | |
| | | | 23NCCN04 | NCC - National Cadet Corps | NCC | NCC | | | | | | | | | | |
| | | | 23IKSN05 | Indian Knowledge System | HSS | HSS | | | | | | | | | | |
| Total | | | | | | | 20 | 15 | 4 | 6 | 7 | 500 | | 350 | 50 | 900 |

BSC: Basic Science Course; PCC: Professional Course; IPCC: Integrated Professional Core Course; PCCL: Professional Core Course Laboratory; AEC: Ability Enhancement Course; HSMC: Humanities, Social Sciences & Management Course; NCMC: Non Credit Mandatory Course;

{ @ - Compulsory one activity during the semester }

{ I.E.-Industry Experts }.

PBL: project Based learning; ABL: Activity Based Learning; SL: Self-Learning

ETC (Emerging Technology Course):

For ETC (L:T:P:O) can be planned by the depts considering practicality & possibility of conduction, same shall be indicated along with course title in the list, if altered than above. If planned altering the prescription, the same shall be approved at the department BOS & authorities. Atleast one activity is mandatory during the delivery of the course. The guidelines is applicable to all the semesters III to VI semesters (ETC-1 to ETC-4).

Bioscience & UHV-Universal Human Values:

1) Any one of the course will be offered by the departments in each semester of IV & VI based on the institutional planning.

2) Both the courses shall be studied and completed by the students registering each in the two semesters. For example, if Bioscience is offered in the IV semester, UHV-Universal Human Values is offered in the V semester.

NCMC (Non Credit Mandatory Course) for course type series-4: Refer to guidelines in III SEM.

| Emerging Technology Course - 2 | |
|--------------------------------|---|
| Course Code | Course Title |
| 23EEE421 | Power Generation Techniques & Economics |
| 23EEE422 | Introduction to Electric Vehicle Technology |
| 23EEE423 | PLC & Electrical System Automation |
| 23EEE424 | Object Oriented Programming with Java |



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Department of Electrical and Electronics Engineering

(Accredited by NBA)



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| Sl. No. | Course Code | Course | Pg No. |
|---------|-------------|---|----------|
| 1 | 23EEI301 | Transforms and Statistics | 1 to 3 |
| 2 | 23EET302 | Transformers and Generators | 4 to 6 |
| 3 | 23EEI303 | Electric Circuit Analysis | 7 to 10 |
| 4 | 23EEI304 | Analog & Digital Circuits | 11 to 13 |
| 5 | 23EEL305 | Electrical Machines lab 1 | 14 to 15 |
| 6 | 23EEE311 | Modern Measurements and Instrumentation | 16 to 18 |
| 7 | 23EEE312 | Introduction to Solar Photovoltaic systems | 19 to 21 |
| 8 | 23EEE313 | Micro & Nano Scale Sensors & Transducers | 22 to 24 |
| 9 | 23EEE314 | Programming in C++ | 25 to 27 |
| 10 | 23EEAE33 | Troubleshooting on Electrical appliances, Wiring and Auto CAD | 28 to 31 |
| 12 | 23PDSN03 | Skillful Futures: Empowering aptitude and soft skills | 32 to 33 |
| 13 | 23EET401 | Probability Distributions and Linear Algebra | 34 to 36 |
| 14 | 23EET402 | Electric Motors | 37 to 39 |
| 15 | 23EEI403 | Microcontrollers | 40 to 43 |
| 16 | 23EEI404 | Transmission & Distribution | 44 to 47 |
| 17 | 23EEL405 | Electrical Machines lab 2 | 48 to 49 |
| 18 | 23EEE421 | Power Generation Techniques & Economics | 50 to 52 |
| 19 | 23EEE422 | Introduction to Electric Vehicle Technology | 53 to 55 |
| 20 | 23EEE423 | PLC & Electrical System Automation | 56 to 58 |
| 21 | 23EEE424 | Object Oriented Programming with Java | 59 to 61 |
| 22 | 23EEAE44 | Network Security | 62 to 66 |
| 24 | 23PDSN04 | Mindful mastery : Aptitude and Softskills integration | 67 to 68 |



Autonomous Syllabus: III Semester

25/05/2024

| | | | |
|--|----------|---------------------|-------------------------|
| Semester: | III | Course Type: | IBSC |
| Course Title: Transforms and Statistics | | | |
| Course Code: | 23EEI301 | Credits: | 4 |
| Teaching Hours/Week (L:T:P:O) | 2:2:2:@ | Total Hours: | 40+(10 to 12 Lab slots) |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | Total Marks: | 100 |
| | | Exam Hours: | 3 |
| I. Course Objectives: | | | |
| This course will enable students to: | | | |
| <ol style="list-style-type: none"> 1. Have an insight into Laplace transforms, Fourier series, Fourier transforms, Z-transforms. 2. Develop knowledge of solving problems in engineering application using transforms. 3. Develop knowledge of Statistical methods and curve fitting arising in engineering. | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes. | | | |
| <ol style="list-style-type: none"> 1. In addition to the traditional lecture method, innovative teaching methods shall be adopted. 2. State the need for Mathematics with Engineering Studies and Provide real-life examples. 3. Grading assignments and quizzes and documenting students' progress. 4. Encourage the students for group learning to improve their creative and analytical skills. Encourage students to work in groups to promote collaborative learning. | | | |
| III. COURSE CONTENT | | | |
| III(a).Theory PART | | | |
| Module-1: Laplace Transforms | | | 8 Hrs |
| Existence and Uniqueness of Laplace transform, transforms of elementary functions, Properties of Laplace transforms, Problems on Laplace's Transform of $e^{at}f(t)$, $t^n f(t)$, $\frac{f(t)}{t}$. Laplace transforms of Periodic functions, and unit-step function – problems. (Textbook 1: Chapter 21.1 to 21.5, 21.9, 21.10, 21.17) | | | |
| Teaching-Learning Process: Chalk and Talk, PPT, videos. | | | |
| Self Learning: Unit impulse function, applications. | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-2: Inverse Laplace Transforms | | | 8 Hrs |
| Inverse Laplace transforms definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) problems. Laplace transforms of derivatives, solution of ordinary linear differential equations, illustrative examples on applications in control system and network analysis. | | | |
| * Illustrative Problems on applications to be excluded for SEE | | | |
| . (Textbook 1: Chapter 21.12, 21.13, 21.14, 21.7, 21.15) | | | |

| Teaching-Learning Process: Chalk and Talk, PPT, videos | |
|--|--|
| Self Learning: Laplace transform of Differentiation, Integration . | |
| RBT Levels: L1, L2, L3 | |
| Module-3: Fourier Series | 8 Hrs |
| Introduction, periodic function, even and odd functions. Dirichlet's conditions, Euler's formulae for Fourier series, problems on time periodic signals, Half range Fourier series. Practical harmonic analysis. (Textbook 1: 10.1, 10.2, 10.4, 10.6,10.7, 10.8, 10.11) | |
| Teaching-Learning Process: Chalk and Talk, PPT, videos | |
| Self Learning: Complex form of Fourier series, Typical waveforms. | |
| RBT Levels: L1, L2, L3 | |
| Module-4: Fourier transforms and Z -transforms | 8 Hrs |
| Infinite Fourier transforms: Definition, Properties, Fourier sine, and cosine transform. Inverse Fourier transforms Inverse Fourier cosine and sine transforms. Problems. | |
| Z-transforms: Definition, Standard z-transforms, Damping, and shifting rules, Problems. Inverse z-transform and applications to solve difference equations, illustrative examples of applications in signals and systems. | |
| * Illustrative Problems on applications to be excluded for SEE (Textbook 1: 22.1, 22.4, 22.5, 23.1 to 23.9, 23.15 (II), and 23.16) | |
| Teaching-Learning Process: Chalk and Talk, PPT, videos | |
| Self Learning: Convolution theorems of Fourier and z-transforms | |
| RBT Levels: L1, L2, L3 | |
| Module-5: Statistical methods | 8 Hrs |
| Principles of least squares, Curve fitting by the method of least squares in the form $y = a + bx$, $y = a + bx + cx^2$, and $y = ax^b$. Correlation, Coefficient of correlation, Lines of regression, Angle between regression lines, rank correlation. (Textbook 1: 24.1, 24.4, 24.5, 24.6(1), 25.12 to 25.16) | |
| Teaching-Learning Process: Chalk and Talk, PPT, videos | |
| Self Learning: Fitting of curves in the form $y = ae^{bx}$ | |
| RBT Levels: L1, L2, L3 | |
| III(b). PRACTICAL PART | |
| Using MATLAB /Simulink software, demonstrate the operation of the following. | |
| Sl. No. | Experiments / Programs / Problems (insert rows as many required) |
| 1 | Write a programme to find the Laplace transform of $\cos at$, $\sin at$, e^{at} , t^n and unit step function and its properties. |
| 2 | Write a programme to find the inverse Laplace transform and Solve RLC circuits using Laplace transform. |
| 3 | Write a programme to obtain Fourier series and its properties. |
| 4 | Implementation of Fourier transforms and its properties. |
| 5 | Implementation of Z transforms and its properties. |
| 6 | Write a programme to find the Correlation between two variables and Plot the Regression line. |
| 7 | Write a Programme to find the Fitting a straight line by the method of least square using MATLAB. |
| 8 | MATLAB programme to solve application problem using Laplace Transform. |
| 9 | MATLAB programme to solve application problem using Fourier Transform. |

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|---|---|---|---|---|---|--------------------|---|---|-------------------------------|----|----|-----------------------------|------|------|------|
| 10 | MATLAB programme to solve application problem using Z Transform | | | | | | | | | | | | | | |
| Instructions for conduction of practical part: <ul style="list-style-type: none"> Use software tools like MATLAB/Simulink or other simulation software for system modelling and analysis. Learn to design, implement, and analyze. | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | |
| CO1 | Illustrate the fundamental concepts of transforms and statistical techniques. | | | | | | | | | | | | | | |
| CO2 | Apply the knowledge of transform calculus, Fourier series and statistical techniques to solve engineering problems. | | | | | | | | | | | | | | |
| CO3 | Analyze the solution of the problems using suitable techniques of transform calculus, Fourier series and statistical methods. | | | | | | | | | | | | | | |
| CO4 | Interpret the knowledge of transform calculus, Fourier series and statistical methods in practical situations. | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1) | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 | PSO3 |
| CO1 | 3 | 2 | 1 | | 2 | | | | | | | 1 | 1 | 2 | 2 |
| CO2 | 3 | 3 | 1 | | 2 | | | | | | | 1 | 1 | 2 | 2 |
| CO3 | 3 | 3 | 1 | | 2 | | | | | | | 1 | 1 | 2 | 2 |
| CO4 | 3 | 3 | 1 | | 2 | | | | | | | 1 | 1 | 1 | 1 |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | |
| General Rules: Refer to Annexure Section 2 | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE) & Rubrics: Refer to Annexure Section 2 | | | | | | | | | | | | | | | |
| Semester End Examination (SEE) & Rubrics: Refer to Annexure Section 2 | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | |
| VII(a): Textbooks: | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | | | | Name of the author | | | Edition and Year | | | Name of the publisher | | | |
| 1 | Higher Engineering Mathematics | | | | | B.S. Grewal | | | 44 th Ed., 2018. | | | Khanna Publishers | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | |
| 2 | Advanced Engineering Mathematics | | | | | E. Kreyszig | | | 4 th Edition, 2002 | | | Pearson Education Asia/ PHI | | | |
| 3 | Introductory Methods of Numerical Analysis | | | | | S.S.Sastry | | | 8 th Edition, 2008 | | | John Wiley India Pt. Ltd | | | |
| 4 | Higher Engineering Mathematics | | | | | B.V.Ramana | | | 2 nd Edition 2007 | | | Schaum's Outlines, TMH | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | |
| 1. http://nptel.ac.in/courses.php?disciplineID=111 2. http://www.class-central-central.com/subject/math(MOOCs) 3. http://academiccarth.org/ 4. VTU EDUSAT programme | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | |
| Assignments / Presentation/ Quiz. | | | | | | | | | | | | | | | |

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|--|----------|---------------------|---------------|
| Semester: | III | Course Type: | PCC |
| Course Title: Transformers and Generators | | | |
| Course Code: | 23EET302 | Credits: | 03 |
| Teaching Hours/Week (L:T:P:O) | 2:2:0:@ | Total Hours: | 50 |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | Exam Hours: | 03 Hours |
| I. Course Objectives: Students will be able to | | | |
| <ul style="list-style-type: none"> Understand the construction, working and various tests of single-phase Transformer & three phase transformers. Analyse the working of parallel operation and auto transformers. Understand the construction & working, perform various tests and analyze the operation of synchronous generator. Explain the various advances in transformers & generators. | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| Chalk and talk, PPT presentations, field visits, video lectures. | | | |
| III. COURSE CONTENT | | | |
| Module-1: Single phase Transformers | | | 10 Hrs |
| Single phase Transformers: Necessity of transformer, Ideal transformer, and equivalent circuit, Operation of practical transformer under no-load and on-load with phasor diagrams. Losses and methods of reducing losses, efficiency and condition for maximum efficiency, Predetermination of efficiency, voltage regulation and its significance. Numerical. | | | |
| Textbook:Chapter:sections: Electric machines Ashfaq Hussain/Chapter 1-1.1,1.2,1.30,1.36,1.37, 1.4,1.5,1.7,1.8,1.10,1.14. | | | |
| Pre-requisites (Self Learning): Transformer construction and types, concept of self and mutual inductance. | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-2: Transformer Tests and Three Phase Transformers | | | 10 Hrs |
| Tests: Polarity test, Sumner's test. Open circuit and short circuit tests, calculation of equivalent circuit parameters. | | | |
| Three-phase Transformers: Introduction, Constructional features of three-phase transformers. Transformer connection for three phase operation– star/star, delta/delta, star/delta, delta/star, zig zag, and V –V connection, comparative features. Phase conversion, Labelling of three-phase transformer terminals. | | | |
| Textbook:Chapter:sections: Electric machines Ashfaq Hussain/Chapter-1 & Chapter-2/1.18,1.19,1.20,1.21,1.22,1.23,1.24,1.32,1.33,1.34,1.35,2.10,2.11,2.12,2.12,2.17,2.18,2.20 | | | |
| Pre-requisites (Self Learning): Transformer losses, condition for max efficiency, concept of star and delta connections. | | | |
| RBT Levels: L1, L2, L3 | | | |

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|--|---|---------------|
| Module-3: Parallel operation & Auto Transformers | | 10 Hrs |
| <p>Parallel Operation of Transformers: Necessity of Parallel operation, conditions for parallel operation– Single phase and three phases. Load sharing in case of similar and dissimilar transformers. Numerical.</p> <p>Auto transformers and Tap changing transformers: Introduction to autotransformer-copper economy, equivalent circuit, no load and on load tap changing transformers, Advantages & disadvantages. Numerical.</p> <p>Textbook: Chapter: sections: Electric machines Ashfaq Hussain/Chapter2/2.1,2.4,2.5,2.6,2.39,2.40,2.41,2.42</p> <p>Pre-requisites (Self Learning): Parallel circuit operation, single and three phase power supply, load calculations.</p> | | |
| RBT Levels: L1, L2, L3 | | |
| Module-4: Synchronous Generators | | 10 Hrs |
| <p>Synchronous Generators: Types, Construction, working principle, Characteristics, Armature windings, winding factors, E.M.F equation. Armature reaction, Synchronous reactance, Equivalent circuit, Determination of Voltage regulation by EMF, MMF Method, hunting and damping.</p> <p>Textbook: Chapter: sections: Electric machines Ashfaq Hussain /Chapter-3 & Chapter-6/3.1,3.2,3.3,3.4,3.5,3.6,3.7,3.10,3.11,3.12,3.16,3.17,3.18,3.19,3.20,3.22,3.23,3.25,3.26,3.31,3.35,3.38,3.42,6.9,6.10.</p> <p>Pre-requisites (Self Learning): Synchronous generators types and construction, effect of regulation.</p> | | |
| RBT Levels: L1, L2, L3 | | |
| Module-5: Advances in Transformers & AC Generators | | 10 Hrs |
| <p>Advances in Transformers: Amorphous core distribution transformers, Advantages & Disadvantages of Amorphous Metal Transformers (AMT). Construction of amorphous transformers. Superconducting Transformers, construction and working, Applications.</p> <p>Advances in AC Generators: PMG-Introduction, Working, Components of a Permanent Magnet Generator, Advantages, Applications and Limitations. Variable Speed Diesel Electric Generators-Technologies, Benefits, Limitations, Impact on Greenhouse Gases Emissions and Fuel Efficiency.</p> <p>Textbook: Chapter: sections: 1.M. Carlen, David Xu, J. Clausen, T. Nunn, V. R. Ramanan and D. M. Getson, "Ultra high efficiency distribution transformers," <i>IEEE PES T&D 2010</i>, New Orleans, LA, USA, 2010, pp. 1-7, doi: 10.1109/TDC.2010.5484301.</p> <p>2.teckglobal.com.au/, powerline.net.in/2017/12/09/transformer-technologies.</p> <p>3.M. Yamamoto, M. Yamaguchi and K. Kaiho, "Superconducting transformers," in <i>IEEE Transactions on Power Delivery</i>, vol. 15, no. 2, pp. 599-603, April 2000, doi: 10.1109/61.852991.</p> <p>4.electricity-magnetism.org/permanent-magnet-generators/</p> <p>5.lidsen.com/journals/jept/jept-04-01-003</p> <p>Pre-requisites (Self Learning): Recent Advancements in Transformer and generator technologies.</p> | | |
| RBT Levels: L1, L2, L3 | | |
| IV. COURSE OUTCOMES | | |
| CO1 | Understand and explain the construction and operation of single-phase transformers and autotransformers. | |
| CO2 | Evaluate the performance of three phase transformers by various tests, phase conversion and parallel operation. | |

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|---|-----------------------------------|--|---|------------------------|---|---|---|------------------------------|---|----|----|-----------------------|----|----|----|----|
| CO3 | | Analyze, explain and determine, working and performance of Synchronous Generator by various tests. | | | | | | | | | | | | | | |
| CO4 | | Summarize and interpret various advances of transformers and Generators. | | | | | | | | | | | | | | |
| V. CO-PO-PSOMAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 3 | 2 | | | | 1 | 1 | 1 | | | | 1 | 2 | 3 | | |
| CO2 | 3 | 2 | | | | 1 | 1 | 1 | | | | 1 | 2 | 3 | | |
| CO3 | 3 | 3 | | | | 1 | 1 | 1 | | | | 1 | 2 | 3 | | |
| CO4 | 3 | 3 | | | | 1 | 1 | 1 | | | | 1 | 2 | 3 | | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer annexure section 1 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer annexure section 1 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer annexure section 1 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(a): Textbooks: | | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | | Name of the author | | | | Edition and Year | | | | Name of the publisher | | | | |
| 1 | Electric Machines | | | Ashfaq Hussain | | | | 2nd Edition, 2013 | | | | Dhanpat Rai & Co | | | | |
| 2 | Electrical Machinery | | | Dr. P S Bimbira | | | | 3 rd Edition,2021 | | | | Khanna Publishers | | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | | |
| 1 | Electric Machines | | | D. P. Kothari, et al | | | | 4th Edition, 2011 | | | | Mc Graw Hill | | | | |
| 2 | Principals of Electrical Machines | | | V.K Mehta, Rohit Mehta | | | | 2nd edition, 2009 | | | | S Chand | | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |
| https://www.youtube.com/@eeedepartment4878 | | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | | |
| Seminars, assignments, quiz, industry visits. | | | | | | | | | | | | | | | | |

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|--|----------|---------------------|--------------------------------|
| Semester: | III | Course Type: | IPCC |
| Course Title: Electric Circuit Analysis | | | |
| Course Code: | 23EEI303 | Credits: | 04 |
| Teaching Hours/Week (L:T:P:O) | 3:0:2:0 | Total Hours: | 40 (Theory)+ 14 (Lab Slots) |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | Exam Hours: | 03 |
| I. Course Objectives: | | | |
| <ul style="list-style-type: none"> • Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits. • Apply the mesh & nodal analysis concepts to solve simple and complex networks using network theorems along with concept of dot convention in coupled circuits. • Find the time constants, initial and final values, and complete responses for RLC circuits under ac and dc excitations. • Analyse unbalanced loads connected to balanced three-phase supply and understand the concept of power factor and improvement techniques. | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| <ul style="list-style-type: none"> • Chalk and talk method • Power point presentation • Pre-recorded videos • Animations • Self-learning | | | |
| III. COURSE CONTENT | | | |
| III(a). Theory PART | | | |
| Module-1: Circuit Analysis using Basic concepts | | | 8 Hrs |
| Circuit Analysis using Basic concepts : Active & Passive elements, Ideal & Practical sources, Source transformation, Network reduction using star-delta transformation, Analysis of network on Mesh & Node for AC and DC circuits, Super mesh and Super node for DC circuits with dependent and independent sources, numerical. | | | |
| Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 3,4, 5& 10 sections: 3.1 to 3.5, 4.1 to 4.4, 5.2, 5.5, 10.6 | | | |
| Pre-requisites (Self Learning) Concepts on KVL, KCL, addition and subtraction of voltage and currents, series and parallel circuits, current and voltage divider. | | | |
| RBT Levels: L1,L2,L3 | | | |
| Module-2:Network Theorems | | | 8 Hrs |

| | |
|---|-------|
| Network Theorems: Superposition theorem, Thevenin's theorem, Maximum Power Transfer theorem, Millman's Theorem. Analysis of networks with independent DC and AC source, numerical. | |
| Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 5 & 10 sections : 5.1, 5.3, 5.4, 10.7 Textbook: Introductory Circuit Analysis- Robert L. Boylestad Chapter: 9 & 19 sections : 9.2, 9.3, 9.4, 9.5, 9.8, 19.2 to 19.6 (19.6 only Reciprocity Theorem). | |
| Pre-requisites (Self Learning): Concepts on KVL, KCL, mesh and node. | |
| RBT Levels: L1,L2,L3 | |
| Module-3: Coupled and Resonance circuits | 8 Hrs |
| Coupled Circuits: Mutual Inductance, Coefficient of Coupling, Equivalent inductance of series and parallel connected inductors with mutual inductance, Energy consideration, numerical. | |
| Resonance: Introduction, Analysis of simple series and parallel RLC circuits under resonances. Resonant frequency, Bandwidth and Quality factor at resonance, numerical. | |
| Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 13 sections : 13.1, 13.2 Textbook: Introductory Circuit Analysis- Robert L. Boylestad Chapter: 21 sections : 21.1, 21.2, 21.3, 21.9, 21.10, 21.11, 21.12, 21.4 & 21.5 | |
| Pre-requisites (Self Learning) Basic concepts of self and mutual induction, related equations, energy stored in magnetic circuit. Behaviour of R,L,C under ac supply. | |
| RBT Levels: L1,L2,L3 | |
| Module-4: Transient Analysis | 8 Hrs |
| Transient Analysis Behaviour of circuit elements under switching conditions and their representations, transient analysis of RL and RC circuits under DC excitations, Evaluation of initial conditions, numerical. | |
| Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 8 sections: 8.1, 8.2, 8.3, 8.4 | |
| Pre-requisites (Self Learning) voltage and current associated with capacitance and inductance, Characteristics of voltage and current source, first order and second differential equation. | |
| RBT Levels: L1,L2,L3 | |
| Module-5: Unbalanced three phase and Two port system | 8 Hrs |
| Unbalanced Three Phase Systems: Analysis of unbalanced three phase systems (3-wire and 4 wire systems), calculation of real and reactive Powers. Disadvantage and causes of (low power factor) LPF, Power factor improvement equipment's, numerical. | |
| Two Port networks: Definition z, y, and transmission parameters, Open circuit impedance, short circuit admittance and Transmission parameters and their evaluation for simple circuits, relationship between parameters, numerical. | |
| Textbook: Engineering Circuit Analysis- William H Hayt Chapter: 16 sections : 16.2, 16.4, 16.6 Textbook: Introductory Circuit Analysis- Robert L. Boylestad Chapter: 24 sections : 24.13, 24.14 | |
| Pre-requisites (Self Learning) Basics of three phase systems, build equations for mesh, nodal, identification of series/parallel/star/delta network and respected solutions. | |
| RBT Levels: L1,L2,L3,L4 | |
| III(b). PRACTICAL PART | |

Sl. No.

Experiments

1

To verify network reduction using star-delta transformation

2

To verify the given circuit using Mesh-Current and Node Voltage Method with independent source

3

Verification of Maximum Power Transfer Theorem

4

Determination of Resonant Frequency, Bandwidth and Quality Factor of a RLC Circuit.

5

To perform Steady State Analysis of Mutually Coupled Circuits.

6

To verify transient and steady state analysis of RL and RC circuits

7

Design the value of capacitance to improve the power factor in a three phase circuit.

8

Verification of ABCD parameter and condition of symmetry of a given two port network.

Instructions for conduction of practical part: Experiments 1, 2 & 3 to be performed by discreet components. Experiments 3 to 8 be performed through PSPICE software package.

IV. COURSE OUTCOMES

At the end of the course students will be able to

CO1

Demonstrate the theoretical and practical aspects of mesh & node analysis, Theorems, Resonance, coupled circuits, three phase system and two port circuits in electric circuits

CO2

Solve electric circuits by applying network theorems and verify using simulation tools.

CO3

Analyze behaviour of RLC elements, their frequency response and demonstrate the same using any simulation tool.

CO4

Find the time constants, initial and final values, and complete responses for RL & RC circuits under dc excitations using simulation tool.

CO5

Analyze and demonstrate unbalanced three phase circuits and two port networks.

V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1)

| | | | | | | | | | | | | | | | | |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 3 | 3 | 1 | 1 | 1 | | | | 1 | 1 | | 1 | 1 | | 2 | |
| CO2 | 3 | 3 | 1 | 1 | 3 | | | | 1 | 1 | | 1 | 1 | | 2 | |
| CO3 | 3 | 3 | 1 | 1 | 3 | | | | 1 | 1 | | 1 | 1 | | 2 | |
| CO4 | 3 | 3 | | 1 | 3 | | | | 1 | 1 | | 1 | 1 | | 2 | |
| CO5 | 3 | 3 | | 1 | 3 | | | | 1 | 1 | | 1 | 1 | | 2 | |

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 2

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks:

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---------|---|--|---------------------------|-----------------------|
| 1 | Engineering Circuit Analysis | William H. Hayt, Jack Kemmerly, Steven M. Durbin | 9 th and 2020 | MCGraw Hill |
| 2 | Electrical Circuit Analysis and Synthesis | D P Kothari, Akhilesh A Nimje | 1 st and 2017 | NEW AGE International |
| 3 | Introductory Circuit Analysis | Robert L. Boylestad | 13 th and 2016 | Pearson |

VII(b): Reference Books:

| | | | | |
|---|---|--------------------------------------|--------------------------|-------------------------------------|
| 1 | Circuit Theory | K Channa Venkatesh , D Ganesh Rao | 1 st and 2018 | Cengage Learning India Pvt. Ltd. |
| 2 | Circuits and Networks: Analysis and Synthesis | Sudhakar A and Shyam Mohan SP | 5 th and 2015 | MCGraw Hill |

VII(c): Web links and Video Lectures (e-Resources):

<https://www.youtube.com/playlist?list=PLkeOqogma9vhAYH2Oyyesp5HmHovYGPoL>

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

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|---|----------|---------------------|--------------------------|
| Semester: | III | Course Type: | IPCC |
| Course Title: Analog and Digital Circuits | | | |
| Course Code: | 23EEI304 | Credits: | 4 |
| Teaching Hours/Week (L:T:P:O) | 2:2:2:@ | Total Hours: | 40 Theory + 14 lab slots |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | Exam Hours: | 3 |
| I. Course Objectives: | | | |
| <ul style="list-style-type: none"> To provide the knowledge for the analysis of diode and transistor circuits. To enable students to understand the working and design basic circuits using Diodes, and BJTs. To design and analyse the different Multistage and power amplifiers. The properties of basic gates and simplifications of Boolean expressions using K Maps and Quine- McClusky Techniques. The fundamentals of combinational & sequential circuits with design examples. Illustrate Decoders, Encoders, Digital Multiplexer, Adders, Subtractors and Binary Compactors. | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| <ul style="list-style-type: none"> Chalk and talk method Power point presentation / keynotes Videos Animations | | | |
| III. COURSE CONTENT | | | |
| III(a).Theory PART | | | |
| Module-1: Diode and BJT applications | | | 08 Hrs |
| Diode applications: Diode models, Diode Clippers (shunt type) and diode clampers (Positive & Negative), Bridge wave rectification (with filter), Special purpose diodes - light emitting diodes, Varactor diode, Numerical. | | | |
| Bipolar Junction Transistor (BJT): Working, DC load line analysis, Biasing techniques- Voltage divider bias, stability factor for voltage divider bias. | | | |
| Textbook: Electronic Devices and Circuit Theory- Robert L Boylestad Louis Nashelsky: Chapter 1 & 2: Section: 1.6 to 1.15, 2.1 to 2.11 | | | |
| Pre-requisites (Self Learning) Knowledge on semiconductors, energy levels and doping process, Diode working, VI characteristics, Diode biasing | | | |
| RBT Levels: L1, L2 & L3 | | | |
| Module-2: Power & Multistage Amplifiers: | | | 08 Hrs |
| Multistage Amplifiers: Transistor Amplifiers, Cascade and Cascade connections, Darlington transistor, Darlington emitter follower circuit (A_v and A_i) - design and analysis, numerical. Power amplifiers: Introduction, Transformer coupled class Amplifier, class B amplifier operation, class B amplifier circuits: Transformer Coupled Push-Pull Circuits, numerical. | | | |
| Textbook: Electronic Devices and Circuit Theory- Robert L Boylestad Louis Nashelsky: Chapter: 16 & 18: section: 16.1 to 16.5, 16.8, 18.1 to 18.3 & 18.5 to 18.9. | | | |
| Pre-requisites (Self Learning): Knowledge on Voltage and current gains, KVL & KCL, Series and Parallel circuits, advantages of | | | |

| closedloop circuits, Understanding of Bark hausen's criteria, working of transformers. | |
|--|---|
| RBT Levels: L1,L2,L3 | |
| Module-3: Introduction to Digital Circuits and Combinational circuits | 08 Hrs |
| Combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4,5 variables, Simplifying Max term equations,Simplifying Min term equations, Quine-McCluskey minimization technique, Quine-McCluskey using don't care terms, prime implicants Tables.Gate properties. | |
| Textbook:Digital Principles and Design by Donald D. Givone : Chapter 3: section 3.1 to section3.10 Chapter4: section 4.1 to 4.16 | |
| Pre-requisites (Self Learning): Basics of logic gates, Tabular method of simplification | |
| RBT Levels:L1,L2,L3 | |
| Module-4: Combinational circuits and Introduction to sequential circuits | 08 Hrs |
| Multiplexers (Mux) : Implementation of 4:1, 8:1 Mux, Realization of Boolean expression usingMux Decoders: Implementation of 2:4, 3:8 decoders, Realizing higher order decoder using lower order decoders, realization of Boolean expression using Decoders. Adders: Binary adder, Decimal adder, Adder cum subtractor using binary adder and carry look ahead adders, Programmable logical arrays, Programmable Logic Devices and Programmable Array Logic. | |
| Textbook:Digital Principles and Design byDonald D. Givone : Chapter 5: section 5.1 to 5.10 | |
| Pre-requisites (Self Learning): Basics of logic gates, Boolean expressions. | |
| RBT Levels: L1,L2 &L3 | |
| Module-5: Sequential Circuits | 08 Hrs |
| Flip Flops: Basic bi stable element, Gated SR Latch, Edge triggered D-flip flop, JK-flip flops andT-flip flops Characteristic equation of flip flops, Excitation table for all flip flops. Registers: Types of registers, Shift registers, 4-bit PIPO, PISO, SISO,SIPO registers, Universalshift registers, Counters: Binary ripple counters, Synchronous Binary counters, Counters based on Registers,Design of Synchronous counters. | |
| Textbook: Digital Principles and Design by Donald D. Givone: Chapter 6 : section 6.1 to 6.9 | |
| Pre-requisites (Self Learning): Basics of logic gates, Boolean expression and combinationallogic circuits. | |
| RBT Levels: L1,L2 &L3 | |
| III(b). PRACTICAL PART | |
| Sl. No. | Experiments / Programs / Problems |
| 1 | Design of clipper circuits. |
| 2 | Design of clamper circuits. |
| 3 | Design and analysis of Darlington Emitter Follower. |
| 4 | Design and analysis of Single stage RC coupled amplifier. |
| 5 | Static characteristics of Transistor for CB, CE Mode and determination of h-parameters. |
| 6 | Simplification and realization of a given Boolean expression using logic gates |
| 7 | Realization of 4-bit adder/subtractor using Adder IC |
| 8 | Design and realization of 3-bit random sequence generator using JK Flip flops |

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|---|--|---|---------------------------------------|---|-------------------------------|---|-------------------------------|---|---|----|----|----|----|----|----|----|
| 9 | Realization of 3-bit mod-N counter using counter IC | | | | | | | | | | | | | | | |
| 10 | Realization of Johnson and Ring counter | | | | | | | | | | | | | | | |
| Instructions for conduction of practical part: All experiments are conducted by discreet components | | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | | |
| CO1 | Study of fundamentals of diode application and BJT | | | | | | | | | | | | | | | |
| CO2 | Build and verify the multistage amplifiers, and power amplifiers using BJT | | | | | | | | | | | | | | | |
| CO3 | Apply the knowledge of K Maps for simplification of Boolean expressions and describe | | | | | | | | | | | | | | | |
| CO4 | Design combinational circuits for code conversion, multiplexer, decoder, adders | | | | | | | | | | | | | | | |
| CO5 | Analyse sequential circuits using flip flops for registers and counter operations | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 3 | 3 | | | | 2 | 2 | | | | | | | | 3 | |
| CO2 | 3 | 3 | | | | 2 | 2 | | | | | | | | 3 | |
| CO3 | 3 | 3 | | | | 2 | 2 | | | | | | | | 3 | |
| CO4 | 3 | 3 | | | | 2 | 2 | | | | | | | | 3 | |
| CO5 | 3 | 3 | | | | 2 | 2 | | | | | | | | 3 | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure section 2 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure section 2 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure section 2 | | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | Name of the author | | Edition and Year | | Name of the publisher | | | | | | | | | |
| 1 | Digital Principles and Design | | Donald D. Givone, | | Tata McGraw-Hill Edition 2017 | | TATA McGraw-hill Edition | | | | | | | | | |
| 2 | Fundamentals of Digital circuits | | A.Anand Kumar | | 4th edition 2016 | | PHI | | | | | | | | | |
| 3 | Electronic Devices and Circuit Theory | | Robert L Boylestad Louis Nashelsky | | 11th Edition, 2015. | | Pearson | | | | | | | | | |
| VII(b): Reference Books: (Insert or delete rows as per requirement) | | | | | | | | | | | | | | | | |
| 1 | Logic Design | | R D Sudhakar Samuel | | Revised 2004 | | Sanguine technical Publishers | | | | | | | | | |
| 2 | Electrical Technology, Electronic Devices and Circuits | | B.L. Theraja, A.K. Theraja, S. Chand | | Reprint, 2013 | | | | | | | | | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |
| 1. https://www.youtube.com/@eeedepartment4878 2. https://www.youtube.com/@VTUeShikshanaProgramme 3. Switching Circuits and Logic Design by Prof.IndranilSengupta (youtube) 4. NPTEL | | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | | |
| Assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc. | | | | | | | | | | | | | | | | |

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|--|---|--------------|----------|--------------|-----|
| Semester: | III | Course Type: | PCCL | | |
| Course Title: Electrical Machines Lab 1 | | | | | |
| Course Code: | 23EEL305 | | Credits: | | 01 |
| Teaching Hours/Week (L:T:P:O) | | | 0:0:2:0 | Total Hours: | 28 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Practical | | | Exam Hours: | 03 |
| I. Course Objectives: At the end of the course student will be able to | | | | | |
| <ul style="list-style-type: none">Conduct various tests on transformers and synchronous machines and evaluate their performances.Perform the parallel operation & phase conversion on transformers.Calculate and compare the voltage regulation of an alternator using different methods | | | | | |
| II.COURSE CONTENT | | | | | |
| Sl. No. | Experiments / Programs / Problems(insert rows as many required) | | | | |
| 1. | Open Circuit and Short circuit tests on single phase step up or step-down transformer and predetermination of (i) Efficiency and regulation (ii) Calculation of parameters of equivalent circuit. | | | | |
| 2. | Sumpner's test on similar transformers and determination of combined and individual transformer efficiency. | | | | |
| 3. | Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load | | | | |
| 4. | Polarity test and connection of 3 single-phase transformers in star – delta and determination of efficiency and regulation under balanced resistive load. | | | | |
| 5. | Comparison of performance of 3 single-phase transformers in delta – delta and V – V (open delta) connection under load. | | | | |
| 6. | Scott connection with balanced and unbalanced loads. | | | | |
| 7. | Separation of hysteresis and eddy current losses in single phase transformer. | | | | |
| 8. | Voltage regulation of an alternator by EMF method. | | | | |
| 9. | Voltage regulation of an alternator by MMF method. | | | | |
| 10. | Slip test – Measurement of direct and quadrature axis reactance | | | | |
| Experiments to be done Using SCI LAB | | | | | |
| 11. | Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load sharing and analytical verification given the Short circuit test data. | | | | |
| 12. | Power angle curve of synchronous generator | | | | |
| Instructions for conduction of practical part: Refer Annexure section 4 | | | | | |
| III.COURSE OUTCOMES | | | | | |
| CO1 | Conduct different tests on transformers to evaluate the performance characteristics of the 1-phase and 3-phase transformers. | | | | |
| CO2 | Connect and operate transformers of different KVA rating in parallel and connect three transformers for three phase operation and phase conversion. | | | | |

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|--|----------|----------------|----------|--------------|------|
| Semester: | III | Course Type: | ETC | | |
| Course Title: Modern Measurements and Instrumentation | | | | | |
| Course Code: | 23EEE311 | | Credits: | | 03 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Mark s: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 03 |
| I. Course Objectives: At the end of the course, students will be able to | | | | | |
| <ul style="list-style-type: none">Understand and measure electrical systems parameters.Study and understand current and potential transformers.Study different types of sensors, transducers, and their applications.Explain the data acquisition system and virtual instrumentation | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk & Talk Method,Presentation/KeynoteVideos | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1: Measurement of electrical circuit parameters | | | | | 8Hrs |
| Introduction: Measurements, significance of measurements, methods of measurements, Elements of a generalized measurement systems, errors, types of errors, statistical treatment of data. Measurement of resistance, inductance, and capacitance: Wheatstone's bridge, bridge sensitivity limitations. Kelvin's double bridge, Sources and detectors, Maxwell's LC bridge, Schering bridge, Errors in ac bridges and method of minimization, numerical. | | | | | |
| Textbook:A Course in Electrical & Electronic measurements & instrumentation-A.K.Sawhney Chapter:1, 3, 13 , 16 sections: 1.1 to 1.5.3 , 3.1 to 3.10, 13. 5 to 13.17, 16.1 to 16.10 | | | | | |
| Pre-requisites (Self Learning) Basic Principles of Kirchhoff's laws, Behavior of R, L and C | | | | | |
| RBT Levels:L1, L2, L3 | | | | | |
| Module-2: Instrument Transformers | | | | | 8Hrs |
| Instrument Transformers: Introduction, terms relating to instrument transformers, Current transformer-Relationships, errors, characteristics, clip-on type current transformer. Potential transformer-comparison of CT and PT, relationships, characteristics, reduction of errors in instrument transformers. capacitor potential transformer, testing of instrument transformer-absolute method, numerical. | | | | | |
| Textbook: Electrical Measurements and Measuring Instruments, by R K Rajput Chapter: 4 Sections:4.1 to 4.6 | | | | | |
| Pre-requisites (Self Learning) Basics of Transformers | | | | | |
| RBT Levels: L1, L2, L3 | | | | | |
| Module-3: Digital instruments | | | | | 8Hrs |

Digital measurements of electrical quantities: Basic concepts of digital instruments-binary counters, display devices, frequency counters, period counters, A/D and D/A converters, characteristics of digital meters. Digital Voltmeters-Introduction, advantages, characteristics, applications, classification of DVMs-RAM type. Digital LCR meter, digital multimeter. Microprocessor based instruments.

Textbook: Electrical Measurements and Measuring Instruments, by R K Rajput

Chapter: 10 Sections:10.1 to 10.6

Pre-requisites (Self Learning)

Analog and digital systems

RBT Levels: L1, L2

Module-4: Sensors & Transducers

8Hrs

Sensors: Introduction to sensor, sensor Characteristics, Types of Sensors-Temperature, position sensors, proximity sensor, IR-Sensor (Infrared Sensor), Pressure Sensor, Light Sensor, Ultrasonic Sensor, Smoke, Gas and Alcohol Sensor.

Transducers: classification of transducers, basic requirement of transducers, temperature transducers-RTD, Thermocouple, Piezo electric transducer.

Textbook:

- 1) "Advances in modern sensors" by G R Sinha, Chapter: 1, Sections:1.1 to 1.3
- 2) "Transducer Engineering" by Renganathan. S, Allied Publishers, Chennai, 2003- , Chapter 2, 4, 7: Sections : 2.1 to 2.2.3,4.4.5 to 4.4.8, 7.1 to 7.7.1.

Pre-requisites (Self Learning)

Basics of force, motion, and energy.

RBT Levels: L1, L2

Module-5: Data Acquisition system and Virtual instrumentation

8Hrs

Data Acquisition System (DAS): Introduction, Components of an Analog Data Acquisition Systems, Components of Digital data acquisition system, Uses of Data Acquisition Systems.

Virtual instrumentation (VI): Introduction, traditional and virtual measurements, hardware and software, VI for test, control and design, VI in the engineering process.

Textbook:

1. A Course in Electrical and Electronic Measurements and Instrumentation- A.K.Sawheney: Chapter-30 Sections: 30.1 to 30.5
2. Virtual Instrumentation using Labview- Jovitha Jerome , Chapter: 1, Sections: 1.1, 1.4 to 1.8.

Pre-requisites (Self Learning)

Instrumentation systems

RBT Levels: L1, L2

IV. COURSE OUTCOMES

At the end of the course students will be able to:

| | |
|------------|--|
| CO1 | Understand the significance of measurements, errors, types to identify and select suitable bridges for the measurement of electrical circuit parameters. |
| CO2 | Explain the various aspects of instrument transformers. |
| CO3 | Analyse and explain the working of digital instruments. |
| CO4 | Explain the different types of sensors and transducers with applications. |
| CO5 | Understand the data acquisition system and virtual instrumentation. |

V. CO-PO-PSO MAPPING

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| CO1 | 3 | 2 | | | | 1 | | 2 | | | | | 3 | | | |
| CO2 | 3 | 2 | | | | 1 | | 1 | | | | | 3 | | | |

| | | | | | | | | | | | | | | | | |
|---|--|---|--|--|---|-------------------------|--|---|----------------------------------|--|--|---|---|--|--|--|
| CO3 | 3 | 2 | | | | 1 | | 1 | | | | | 3 | | | |
| CO4 | 3 | 2 | | | | 1 | | 1 | | | | | 3 | | | |
| CO5 | 3 | 2 | | | 1 | 1 | | 1 | | | | | 3 | | | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure section 1 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure section 1 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure section 1 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(a): Textbooks: | | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | | | | Name of the author | | | Edition and Year | | | Name of the publisher | | | | |
| 1 | A Course in Electrical & Electronic measurements & instrumentation | | | | | A.K.Sawhney, | | | Nineteenth revised edition 2011. | | | Dhanpat Rai and company (Pvt) limited, New – Delhi. | | | | |
| 2 | Electrical Measurements and Measuring Instruments | | | | | R K Rajput | | | Second edition, reprint 2021 | | | S Chand and company | | | | |
| 3 | Transducer Engineering | | | | | Renganathan. S | | | 2003 | | | Allied Publishers | | | | |
| 4 | Advances in modern sensors | | | | | G R Sinha | | | 2020 | | | IOP Publishing | | | | |
| 5 | Virtual Instrumentation using Labview | | | | | Jovitha Jerome | | | 2010 | | | PHI Learning | | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | | |
| 1 | Electronic instrumentation & measurements | | | | | David.A.Bell, | | | 3rd edition 2013 | | | Oxford University. | | | | |
| 2 | Basic Electrical Measurements | | | | | M B Stout | | | 2020 | | | Prentice-hall Inc., Englewood Cliffs, N. J. | | | | |
| 3 | Electrical Measurements and Measuring Instruments | | | | | E.W Golding, F.C Widdis | | | 2017 | | | Engineering Degree Series Pitman | | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |
| NPTEL :: Electrical Engineering - NOC:Electrical Measurement and Electronic Instruments | | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | | |
| Seminar, assignments, quiz, self-study activities, group discussions, etc | | | | | | | | | | | | | | | | |

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|---|----------|--------------|----------|--------------|---------|
| Semester: | III | Course Type: | ETC | | |
| Course Title: Introduction to Solar Photovoltaic Systems | | | | | |
| Course Code: | 23EEE312 | | Credits: | | 3 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| This course will enable students: | | | | | |
| <ul style="list-style-type: none">To discuss basics of solar resource data, its acquisition and usage.To discuss PV technology, characteristics and interconnections of modules.To discuss batteries, converters and inverters, system components for standalone SPV system and designing of standalone SPV system.To explain the functioning of grid connected system and different applications of SPV systems.To explain maintenance of PV systems | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk methodPower point presentation / keynotesVideosField Visit | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1: Solar energy fundamentals. | | | | | 8 Hrs |
| Introduction, Need for Sustainable energy sources, Environmental impact of fossil fuels, Energy Security and potential for conflicts, Classification of non-conventional energy sources, Sustainable Sun Energy, Sun energy-advantages, Conversion challenges, other energy alternatives, solar thermal technologies, Silicon solar technologies, Solar Cell Parameters-current, voltage, fill factor and efficiency. Losses in solar cells. | | | | | |
| Textbook: Chapter: sections: “Solar Photovoltaics Fundamentals, Technologies and Application”, Chapter 1, Section 1.1,1.2,1.3,1.4.2,1.5. Chapter 5: Section 5.1 and 5.2. | | | | | |
| Pre-requisites (Self Learning): Basics of Electrical engineering and physics fundamentals. | | | | | |
| RBT Levels: L1, L2 | | | | | |
| Module-2 Solar Geometry | | | | | 8 Hrs |
| Introduction, Sun and the earth, extra terrestrial solar radiation, solar spectrum at the earth surface, sun-earth movement, Declination angle, Angle of sunrays on solar collector, Local apparent time (LAT), Sun tracking, vertical axis tracking, Solar radiation on Tilted Surfaces, definitions, Measurement of Solar Radiation-pyranometer and pyrheliometer. Simple Numerical. | | | | | |
| Textbook: Chapter: sections: “Solar Photovoltaics Fundamentals, Technologies and Application”, Chapter 12, Section 12.1, 12.1.1, 12.1.2, 12.2, 12.2.1, 12.3, 12.3.1, 12.3.2, 12.4, 12.5.4, 12.6 | | | | | |
| Pre-requisites (Self Learning): Fundamentals of Physics. | | | | | |
| RBT Levels: L1, L2, L3 | | | | | |

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| Semester End Examination (SEE): Refer Annexure Section 1 | | | | |
|--|--|-----------------------|-------------------------------------|--------------------------|
| VII. Learning Resources | | | | |
| VII(a): Textbooks: | | | | |
| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
| 1 | Solar Photovoltaics Fundamentals, Technologies and Application | Chethan Singh Solanki | Third Edition | PHI |
| 2 | Solar Photovoltaics Technology and Systems | Chethan Singh Solanki | 9 th Edition, April 2018 | PHI |
| VII(b): Reference Books: (Insert or delete rows as per requirement) | | | | |
| 1 | Non- Conventional Sources of energy. | G D Rai | 6th Edition 2017 | Khanna Publishers |
| 2 | Solar Energy | S P Sukhatme | 4th Edition, | Mc Graw Hill Publication |
| VII(c): Web links and Video Lectures (e-Resources): | | | | |
| 1. NPTEL course on Design of Photovoltaic Systems by Prof. L Umanand, IISc Bangalore. (NPTEL:: Electronics & Communication Engineering - NOC:Design of photovoltaic systems) | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc | | | | |

| | | | | | |
|--|----------|--------------|----------|--------------|---------|
| Semester: | III | Course Type: | ETC | | |
| Course Title: Micro and Nano-Scale Sensors and Transducers | | | | | |
| Course Code: | 23EEE313 | | Credits: | | 3 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| <ul style="list-style-type: none">To explain measurement of pressure using sensors, based nanotechnology, their structure, theory of operation.To explain structure, theory of operation of sensors based on nanotechnology for Motion, acceleration, measurement, gas and smoke detection.To explain sensors based on nanotechnology for the measurement of atmospheric moisture and moisture inside the electronic components.To explain Optoelectronic and Photonic Sensors used in optical microphones, fingerprint readers, and highly sensitive seismic sensors.To explain classification of transducers, advantages and disadvantages of electrical transducers, transducers actuating mechanism, resistance, variable inductance and capacitive transducers. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| Mention the planned/proposed sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. <ul style="list-style-type: none">Chalk and talk methodPower point presentation / keynotesVideosField Visit | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1: Pressure Sensors: | | | | | 8 Hours |
| Capacitive Pressure Sensors- Structure, Theory and experimental results, Inductive Pressure Sensors- Structure, Theory and experimental results, Ultrahigh Sensitivity Pressure Sensors- Structure, Theory and experimental results. | | | | | |
| Textbook: Chapter: sections: Micro and Nano scale sensors and Transducers: Chapter 1, section 1.1,1.2,1.3 | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Sensor technology | | | | | |
| RBT Levels: L1, L2 | | | | | |
| Module-2: Motion and Acceleration Sensors | | | | | 8 Hours |
| Motion and Acceleration Sensors: Ultrahigh Sensitivity Wide Dynamic Range Sensors - Structure, Theory and experimental results, Other Motion and Acceleration Microsensors. | | | | | |
| Gas and Smoke Sensors: | | | | | |
| A CO Gas Sensor Based on Nanotechnology – Structure, Theory, Assembly of the Sensor, Experimental Results, Auxiliary Experimental Results, Smoke Detectors – Structure, Qualitative Description of the Detector, Theory, Experimental Results. | | | | | |

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|--|--|
| Textbook:Chapter:sections: : Micro and Nano scale sensors and Transducers: Chapter 2, section 2.1,2.2, Chapter 3, section 3.1, 3.2 | |
| Pre-requisites (Self Learning) Motion Sensor technology | |
| RBT Levels: L1, L2 | |
| Module-3: Moisture Sensors and Optoelectronic and Photonic Sensors | 8 Hours |
| Moisture Sensors: Structure, Theory, Main Experimental Results, Auxiliary Experimental Results. Optoelectronic Microphone- Introduction and Principle of Operation, Theory, Description of the Image Acquisition/Pattern Recognition Hardware and Software, Experimental Results, Other Optoelectronic and Photonic Micro Sensors. | |
| Textbook:Chapter:sections: Micro and Nano scale sensors and Transducers :Chapter 4, section 4.1 to 4.6, Chapter 5, section 5.1, 5.2 | |
| Pre-requisites (Self Learning) Moisture & Photonic sensor technology | |
| RBT Levels: L1, L2 | |
| Module-4: Biological, Chemical, and “Lab on a Chip” Sensors | 8 Hours |
| Biological, Chemical, and “Lab on a Chip” Sensors: Lab on a Chip Sensors, Other Biochemical Micro- and Nano-Sensors. Electric, Magnetic, and RF/Microwave Sensors: Magnetic Field Sensors: Introduction and Principle of Operation, Theory, Manufacturing and Assembly of the Prototype Sensor, Numerical Data and Experimental Results, Other Important Electromagnetic/RF Micro- and Nano-Sensors. | |
| Textbook:Chapter:sections: Micro and Nano scale sensors and Transducers :Chapter 6, section 6.1, 6.2 Chapter 7, section 7.1, 7.2 | |
| Pre-requisites (Self Learning) Biochemical, Electro, Magnetic sensors | |
| RBT Levels: L1, L2 | |
| Module-5: Transducers and Special Purpose Sensors | 8 Hrs |
| Transducers: Introduction, Classification of Transducers, Advantages and Disadvantages of Electrical Transducers, Transducers Actuating Mechanisms, Resistance Transducers, Variable Inductance Transducers, Capacitive Transducers Special Purpose Small-Scale Devices: Aircraft Icing Detectors - Introduction and Principle of Operation, Theory, Performance Data and Experimental Results, Conclusion. Microfluidic, Microactuators. | |
| Textbook:Chapter:sections: Electrical and Electronic Measurements and Instrumentation- R K Rajput, Chapter-16 section 16.1 to 16.8, Micro- and Nano-Scale Sensors and Transducers Chapter 8, section 8.1 to 8.2 | |
| Pre-requisites (Self Learning) Special purpose devices | |
| RBT Levels: L1, L2 | |
| IV. COURSE OUTCOMES | |
| At the end of the course the student will be able to: | |
| CO1 | Outline the differences between the sensor and transducer technology based on nanotechnology and nanofabrication and the classical sensor technologies |
| CO2 | Explain the informed selection of a sensor or transducer for a particular application; |
| CO3 | Explain the knowledgeable about the technologies that are available commercially at the present time. |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | |

| PO/PS O | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 |
|------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| CO1 | 2 | 2 | | | | 2 | 2 | | | | | | | 2 | |
| CO2 | 2 | 2 | | | | 2 | 2 | | | | | | | 2 | |
| CO3 | 2 | 2 | | | | 2 | 2 | | | | | | | 2 | |

VI. Assessment Details (CIE & SEE)

General Rules: Refer annexure section 1

Continuous Internal Evaluation (CIE): Refer annexure section 1

Semester End Examination (SEE): Refer annexure section 1

VII. Learning Resources

VII(a): Textbooks:

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---------|--|--------------------|------------------|-----------------------|
| 1 | Micro- and Nano-Scale Sensors and Transducers, | Ezzat G. Bakhoun | 2015 | CRC Press |

VII(b): Reference Books:

| | | | | |
|---|--|------------|-------------------------|---------|
| 1 | Electrical and Electronic Measurements and Instrumentation | R K Rajput | 3 rd Edition | S Chand |
|---|--|------------|-------------------------|---------|

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.

<https://www.youtube.com/watch?v=vjpUFF51taU&list=PLp6ek2hDcoNBrYuh8TYc3YNQUvKannqiRa>
https://www.youtube.com/watch?v=9qh_7spq6sw
<https://www.youtube.com/watch?v=j9y0gfN9WMg&list=PL5873EDBDFB69BAD8>

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Mention suggested Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

| | | | |
|---|---------------------------|---------------------|-------------------------|
| Semester: | III | Course Type: | ETC |
| Course Title: | Programming in C++ | | |
| Course Code: | 23EEE314 | Credits: | 3 |
| Teaching Hours/Week (L:T:P:O) | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | | Total Marks: 100 |
| | | Exam Hours: | 3 Hours |
| I. Course Objectives: At the end of the course student will be able to | | | |
| <ul style="list-style-type: none"> Understand about object-oriented programming to acquire knowledge about the capability to store data together in an object. Develop technique to represent entity as a real time object using Class, object, and Inheritance. Understand about functions and special type of functions constructors which are special type of. Create and handle data in files using file I/O operations. Apply the concepts of Exception handling to develop robust programs. | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| <ul style="list-style-type: none"> Chalk and talk method. Power point presentation / keynotes Videos | | | |
| III. COURSE CONTENT | | | |
| Module-1: Principles of OOP | | | 8 Hrs |
| Principles of object-oriented programming - Basic Concepts of OOPS, Benefits of OOP, Structure of C++ program, Tokens, keywords, identifiers, Basic datatypes and user defined datatypes in C++, Declaration of variables, Operators: Scope resolution operator, Member dereferencing operators and memory management operators, manipulators, A simple C++ program Textbook: “Object Oriented Programming with C++” - Balagurusamy E Chapter 1: Section: 1.5, 1.6 Chapter 2: Section: 2.3, 2.6 Chapter 3: Section: 3.2, 3.3,3.4,3.5,3.6, 3.11 to 3.18 Pre-requisites (Self Learning) : Structure of C Programming | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-2 : Control Structures and Functions in C++ | | | 8 Hrs |
| Control Structures: Sequence, Selection and Loop control structures. Functions in C++: Introduction, Main function, Function prototype, Functions call by value, call by address, call by reference & return by reference, Default arguments, inline functions, Recursion, Function Overloading. Textbook: “Object Oriented Programming with C++” - Balagurusamy E Chapter 4: Section: 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8 and 4.9 Pre-requisites (Self Learning): Concepts of Functions in C Programming. | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-3: Introduction to Classes and Objects | | | 8 Hrs |

Classes and Objects – Specifying a class, Access Specifiers: Public, Private and Protected, Data members and Data member functions in a class, memory allocation for objects, Static data member and Static member functions,

Textbook: “Object Oriented Programming with C++” - Balagurusamy E Chapter 5: Section: 5.3, 5.4, 5.5, 5.10, 5.11 and 5.12

Pre-requisites (Self Learning): Basic implementation of Structure in C Programming

RBT Levels: L1, L2, L3

Module-4: Concept on Special type of Functions and Code reusability

8 Hrs

Constructors and Destructors: Constructors, parameterized constructors, multiple constructors in a class, copy constructor, dynamic constructors, and destructors.

Inheritance: Introduction, defining derived classes, Types of inheritance: Single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, and hybrid inheritance.

Textbook: “Object Oriented Programming with C++” - Balagurusamy E Chapter 6: Section: 6.1, 6.2, 6.3, 6.4, 6.7, 6.8, 6.11 Chapter 8: Section: 8.1, 8.2, 8.3, 8.5, 8.6, 8.7, 8.8

Pre-requisites (Self Learning): Knowledge in C Programming

RBT Levels: L1, L2, L3

Module-5: Introduction to Pointers, Polymorphism and File Operations

8 Hrs

Pointers, Virtual and Polymorphism: Pointers, this pointer, Dynamic Polymorphism – Introduction to Virtual functions (Function overriding) and Friend Functions

File operations: Introduction to file, create, read, and write operations in files (Text File), End of file.

Textbook: “Object Oriented Programming with C++” - Balagurusamy E Chapter 9: Section: 9.1, 9.2, 9.4 and 9.6 Chapter 11: Section: 11.1, 11.2, 11.3 and 11.4

Pre-requisites (Self Learning): Basic coding knowledge in any language

RBT Levels: L1, L2, L3

IV. COURSE OUTCOMES

At the end of the course students will be able to

| | |
|------------|--|
| CO1 | Understand the code with extensible Class types, User-defined operators, and functions to provide the solution to a problem using OOP concepts |
| CO2 | Achieve code reusability and extensibility by means of Inheritance and Polymorphism |
| CO3 | Analyse the concepts of Pointers, Static and Dynamic Polymorphism for effective programming in C++ |
| CO4 | Implement the features of C++ in file handling for providing programmed solutions to complex problems. |

V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1)

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| CO1 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | |
| CO2 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | |
| CO3 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | |
| CO4 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | |

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 1

Continuous Internal Evaluation (CIE): Refer Annexure section 1

Semester End Examination (SEE): Refer Annexure section 1

VII. Learning Resources

| VII(a): Textbooks: | | | | |
|---|--------------------------------------|---------------------------|-------------------------|-------------------------------------|
| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
| 1 | Object Oriented Programming with C++ | Balagurusamy E | Seventh Edition, 2018 | Tata McGraw Hill Education Pvt. Ltd |
| VII(b): Reference Books: | | | | |
| 1 | C++ the Complete Reference | Herbert Schildt | 12th Edition, 2023 | McGraw Hill |
| 2 | Programming with ANSI C++ | Bhushan Trivedi | 2nd Edition, 2012 | Oxford Press |
| 3 | Object Oriented Programming With C++ | Bhave | 4th Edition, 2004. | Pearson Education |
| VII(c): Web links and Video Lectures (e-Resources): | | | | |
| 1. Introduction to C++ - https://www.youtube.com/watch?v=BCIS40yzssA 2. Different Functions in C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw Tutorial Link: 1. https://www.w3schools.com/cpp/cpp_intro.asp 2. https://www.edx.org/course/introduction-to-c-3 | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Activities like seminar, assignments, quiz, mini projects, self-study activities, group discussions, Activity Based Learning, Practical Based learning, Project Based learning, Demonstration of simple projects, etc | | | | |

| | | | | | |
|---|----------|--------------|----------|--------------|--------|
| Semester: | 3 | Course Type: | AEC | | |
| Course Title: Troubleshooting on Electrical appliances, Wiring and Auto CAD | | | | | |
| Course Code: | 23EEAE31 | | Credits: | | 01 |
| Teaching Hours/Week (L:T:P:O) | | | 1:0:0:3 | Total Hours: | 40 HRS |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 hrs |
| I. Course Objectives: | | | | | |
| This course will enable students to: | | | | | |
| <ul style="list-style-type: none">• Attain the basic principles and conventions of engineering drawing• Gain familiarity with AutoCAD Electrical interface, Including toolbars, menus and command specific to design• Learn to Create electrical schematics, Panel layouts and other drawings commonly used in electrical engineering.• Troubleshooting of Electrical appliances.• Understand the conduit wiring for commercial building. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| Adopt different types of teaching methods to develop the outcomes through Power point presentations and Video demonstrations. | | | | | |
| <ul style="list-style-type: none">• Adopt teaching methods by using working models• Adopt collaborative (Group Learning) Learning in the class.• Adopt Problem Based Learning (PBL), which foster student’s Analytical skills and develops thinking skills such as evaluating, generalizing, and analysing information with the use of modern tools. | | | | | |
| III. COURSE CONTENT | | | | | |
| III (a) Theory | | | | | |
| Module-1: Basic Skills for Electrical Troubleshooting | | | | | 8 Hrs |
| Basic Skills for electrical troubleshooting, safety first, OSHA requirements regarding troubleshooting and qualified persons, using electrical drawings for troubleshooting, using electrical meters to perform circuit measurements, developing a logical, systematic approach to troubleshooting. | | | | | |
| Reference book: Basic Electrical Trouble shooting by <u>D. Philipp Kaiser</u> . | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| RBT Levels: L1, L2 | | | | | |
| Module-2: Troubleshooting Control Circuits | | | | | 12 Hrs |

| | |
|---|--|
| Building a circuit from a ladder diagram, control circuit industrial applications, control relay logic circuits, automatic motor control circuits, timer sequence circuits, testing field components, control relays, motor starter contactors, overload devices, solid state timers, limit switches, auxiliary contact blocks, indicator lamps, push buttons and selector switches, circuit breakers and fuses | |
| Reference book: Practical Troubleshooting of Electrical Equipment and Control Circuits Mark Brown, Jawahar Rawtani, Dinesh Patil | |
| Pre-requisites (Self Learning) | |
| RBT Levels: L2 | |
| Module-3: Troubleshooting Motors | 8 Hrs |
| Troubleshooting motors, most common motor problems, electrical and mechanical concerns, performing electrical tests on a motor, using the megohmmeter on a motor, testing windings for shorts, opens and ground faults, phase unbalance, phase rotation testing, forward/reverse motor starters | |
| Reference book: Troubleshooting Motors and Controls by Ken Dickson | |
| Pre-requisites (Self Learning) | |
| RBT Levels: L2 | |
| Module-4: Troubleshooting Lighting Circuits | 8 Hrs |
| Troubleshooting lighting circuits, lighting terminology, types of lighting circuits, incandescent lighting, fluorescent lighting, hid lighting, led lighting. | |
| Reference book: Basic Electrical Trouble shooting by <u>D. Philipp Kaiser</u> | |
| Pre-requisites (Self Learning) | |
| RBT Levels: L1, L2 | |
| Module-5: Schematic Wiring & Editing | 4 Hrs |
| Exposure to CAD Commands like Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text, Apply copy, mirroring, array, fillet and trim on the object created | |
| Using Auto CAD prepare a layout diagram, circuit schematic diagram, installation plan and wiring diagram for the following: | |
| a) A bed room with 2 Lamps, 1 fan and one 5A socket. | |
| b) A living room with 4 Lamps, 2 fans and three 5A socket. | |
| c) A Kitchen with one 15A socket, one 5A socket, one light point and one Exhaust fan. | |
| d) A bathroom with one 15A socket, one 5A socket and one light point. | |
| Reference book: Auto cad-electrical-black-book- Gaurav Verma | |
| Pre-requisites (Self Learning) | |
| RBT Levels: L1 | |
| III(b). PRACTICAL PART | |
| Sl. No. | Experiments / Programs / Problems (insert rows as many required) |
| 1 | Concept of Phase wire, Neutral wire, Earth wire and Half wire and determining the size of Conductors, Testing domestic wiring Continuity test (OC & SC Test) |
| 2 | Conduit wiring –Bending procedure of conduits, Drawing of cables through conduits, straight Joint, T joint of wire, Junction box Loop in. |
| 3 | Conduit Wiring for a Two lamps controlled independently and series controlled by one switch. |

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Date:20/05/2024

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|--|---|---|---|-------------------|---|---|---|-------------------------|---|----|----|---|----|----|----|----|
| 4 | Using Auto CAD prepare a layout diagram, circuit schematic diagram, installation plan and wiring diagram for the following: a) A bed room with 2 Lamps, 1 fan and one 5A socket. b) A living room with 4 Lamps, 2 fans and three 5A socket. c) A Kitchen with one 15A socket, one 5A socket, one light point and one Exhaust fan. d) A bathroom with one 15A socket, one 5A socket and one light point. | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | | |
| CO1 | Students should be proficient in basic electrical troubleshooting. | | | | | | | | | | | | | | | |
| CO2 | Students should be able to troubleshooting control circuits | | | | | | | | | | | | | | | |
| CO3 | Students should be able to troubleshooting motors | | | | | | | | | | | | | | | |
| CO4 | Students should be able to troubleshooting lighting circuits | | | | | | | | | | | | | | | |
| CO5 | Students should be able to create various types of electrical drawings, including schematics, panel layouts, and wiring diagrams. | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 2 | | | | 2 | | | | | | | | | | | |
| CO2 | 2 | 2 | 2 | 1 | | | | | | | | | | | | |
| CO3 | 2 | | 2 | | 2 | | | | | | | | | | | |
| CO4 | 1 | 2 | 2 | | 1 | | | | | | | | | | | |
| CO5 | 2 | 2 | 2 | | 1 | 1 | 2 | | | | | | | | | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules:Refer Annexure section 5 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure section 5 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure section 5 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(a): Text Books: | | | | | | | | | | | | | | | | |
| Basic Electrical Trouble shooting | | | | D. Philipp Kaiser | | | | 2014 | | | | CreateSpace Independent Publishing Platform | | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | | |
| 1 | Auto cad-electrical-black-book | | | Gaurav Verma | | | | 2015 | | | | CAD/CAM/CAE Works, USA. | | | | |
| 2 | AutoCAD | | | David Byrnes | | | | 2011 | | | | Wiley Publishing | | | | |
| 3 | Troubleshooting of Electrical Motors | | | Glen A. Mazur | | | | 5 th Edition | | | | 2017 | | | | |

| | | | | |
|--|--|---|----------------|------|
| 4 | Practical Troubleshooting of Electrical Equipment and Control Circuits | Mark Brown, Jawahar Rawtani, Dinesh Patil | Science Direct | 2004 |
| VII(c): Web links and Video Lectures (e-Resources): | | | | |
| Mention the links of the online resources, video materials, etc. https://www.youtube.com/watch?v=Fa5gYiapD1E&t=168s&pp=ygUSYXV0b2NhZCB1bGVjdHJpY2Fs https://www.youtube.com/watch?v=7QQRG2sLbYk&pp=ygUSYXV0b2NhZCB1bGVjdHJpY2Fs | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Mention suggested Activities like seminar, assignments, quiz, mini projects, self-study activities, group discussions, etc | | | | |

| | | | | | |
|---|----------|--------------|----------|--------------|--------|
| Semester: | III | Course Type: | NCMC | | |
| Course Title: SKILLFULL FUTURES: EMPOWERING APTITUDE AND SOFTSKILLS | | | | | |
| Course Code: | 23PDSN03 | | Credits: | | PP/NP |
| Teaching Hours/Week (L:T:P:O) | | | 0:0:0:2 | Total Hours: | 30 |
| CIE Marks: | 50 | SEE Marks: | ---- | Total Marks: | 50 |
| SEE Type: | --- | | | Exam Hours: | 00 |
| I. Course Objectives: | | | | | |
| <div>➤ Strengthen logical and analytical thinking skills required to solve quantitative problems.</div> <div>➤ Discuss the importance of ethical considerations in leadership and negotiation, emphasizing integrity, fairness, and accountability in decision-making and interactions.</div> <div>➤ Apply problem-solving strategies to real-world situations.</div> <div>➤ Crafting Effective Openings and Closings.</div> <div>➤ Develop a systematic approach to creative problem solving</div> | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| Mention the planned/proposed sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes. | | | | | |
| III. COURSE CONTENT | | | | | |
| III(a). Theory PART | | | | | |
| Module-1: Quantitative Aptitude-1 | | | | | 06 Hrs |
| Problems on Permutation and Combination. Problems on Surds and Indices | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-2: Leadership and Negotiation skills | | | | | 06 Hrs |
| Leader skills, Persuasion Skills, Negotiation Skills and Conflict Resolving Skills | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-3: Quantative aptitude - 2 | | | | | 06 Hrs |
| Problems on Percentage, Problems on Profit and Loss , Problems on cubes and Dices | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-4: Letter and Writing Skills | | | | | 06 Hrs |
| Writing Skills, Formal, Informal Letters, Sample Letters, Business Professional writings and Adaptability in writing style | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-5: Logical Reasoning | | | | | 06 Hrs |
| Syllogism Concepts and Logical Deduction | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| IV. COURSE OUTCOMES | | | | | |

Scheme-2023

Date-23/03/2024

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|--|--|---|---|--------------------|---|---|---|------|---|----|----|--------------|----|----|----|----|
| CO1 | Understand Mathematical Concepts such as Arithmetic, algebra, geometry and Statistics | | | | | | | | | | | | | | | |
| CO2 | Develop decision-making abilities by learning techniques for making informed and timely decisions, considering various factors and perspectives. | | | | | | | | | | | | | | | |
| CO3 | Develop problem-solving skills to tackle various quantitative problems efficiently and accurately. | | | | | | | | | | | | | | | |
| CO4 | Develop skills in writing clear and concise letters, conveying the intended message effectively without ambiguity or unnecessary details. | | | | | | | | | | | | | | | |
| CO5 | Understanding Syllogistic Reasoning | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 2 | 2 | | | | | | 2 | | | | 1 | | | | |
| CO2 | | | | | | | | 2 | 2 | | | 2 | | | | |
| CO3 | 2 | 2 | | | | | | 2 | | | | 2 | | | | |
| CO4 | | | | | | | | | | 2 | | 2 | | | | |
| CO5 | 2 | 2 | | | | | | | | | | 1 | | | | |
| VI. Assessment Details of CIE | | | | | | | | | | | | | | | | |
| <p>Continuous Internal Evaluation (CIE): Refer annexure section-8</p> <p>CIE will be conducted by Ethnotech as per the scheduled timetable, with common question papers for the subject.</p> <ul style="list-style-type: none"> •The question paper will have 50 questions. Each question is set for 01 mark. •CIE Pattern will be in MCQ Model (Multiple Choice Questions) for 50 marks. The duration of the examination is 01 Hour. | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | | |
| 1 | Quantitative Aptitude for Competitive examination | | | R S Agarwal | | | | 2017 | | | | S Chand | | | | |
| 2 | Are we leading ? | | | Kaushik Mahaputhra | | | | 2020 | | | | Notion press | | | | |
| 3 | A modern approach to logical reasoning | | | R S Agarwal | | | | 2019 | | | | S Chand | | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |
| https://swayam.gov.in/explorer https://nptel.ac.in/courses | | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | | |
| <p>Mention suggested Activities like</p> <p>Seminar</p> <p>Assignments</p> <p>Quiz</p> <p>Mini projects</p> | | | | | | | | | | | | | | | | |

Autonomous Syllabus: IV Semester

| | | | |
|---|----------|---------------------|-------|
| Semester: | IV | Course Type: | BSC |
| Course Title: Probability Distributions and Linear Algebra | | | |
| Course Code: | 23EET401 | Credits: | 3 |
| Teaching Hours/Week (L:T:P:O) | 2:2:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | Exam Hours: | 3 |
| VIII. Course Objectives: | | | |
| <p>This course will enable students to:</p> <ol style="list-style-type: none"> Understand the concepts of linear algebra, probability distributions, sampling distributions Develop the knowledge of probability, joint probability distribution and sampling theory occurring in digital signal processing, design engineering. Recognize and apply linear algebra concepts in various fields of engineering. | | | |
| IX. Teaching-Learning Process (General Instructions): | | | |
| <p>These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> In addition to the traditional lecture method, innovative teaching methods shall be adopted. State the need for Mathematics with Engineering Studies and Provide real-life examples. Grading assignments and quizzes and documenting students' progress. Encourage the students for group learning to improve their creative and analytical skills. Encourage students to work in groups to promote collaborative learning. | | | |
| X. COURSE CONTENT | | | |
| III(a).Theory PART | | | |
| Module-1: Probability Distributions | | | 8 Hrs |
| <p>Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson, Exponential and normal distributions- Illustrative examples. (Textbook 1: Chapter 26-Section 26.7 to 26.10, 26.14 to 26.17)</p> <p>Teaching-Learning Process: Chalk and Talk, PPT, videos.</p> | | | |
| Self Learning: Exponential distribution. | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-2: Joint probability distribution & Markov Chain | | | 8 Hrs |
| <p>Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.</p> <p>Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states.. (Textbook 2: Chapter 31-[Section 31.1 and 31.2])</p> <p>Teaching-Learning Process: Chalk and Talk, PPT, videos</p> | | | |
| Self Learning: Conditional density function. | | | |
| RBT Levels: L1, L2, L3 | | | |

| XIII. Assessment Details (CIE & SEE) | | | | |
|---|---|--|-----------------------------|-------------------------|
| General Rules: <i>Refer Annexure Section 1</i> | | | | |
| Continuous Internal Evaluation (CIE) & Rubrics: <i>Refer Annexure Section 1</i> | | | | |
| Semester End Examination (SEE) & Rubrics: <i>Refer Annexure Section 1</i> | | | | |
| XIV. Learning Resources | | | | |
| VII(a): Textbooks: | | | | |
| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
| 1 | Higher Engineering Mathematics | B.S. Grewal | 44 th Ed., 2018. | Khanna Publishers |
| 2 | Higher Engineering Mathematics | B.V. Ramana | 11 th Ed., 2017 | Tata Mc Graw-Hill |
| 3 | Linear Algebra and its Applications | David C Lay | 4th Ed.,. | Pearson Publishers |
| VII(b): Reference Books: | | | | |
| 1 | Advanced Engineering Mathematics | E. Kreyszig | 10 th Ed., 2016 | John Wiley & Sons |
| 2 | Advanced Engineering Mathematics | C. Ray Wylie, Louis C. Barrett | 6th Ed., 2017 | McGraw – Hill Book Co., |
| 3 | Probability & Statistics for Engineers & Scientists | Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye | 9th Ed., 2023. | Pearson Education |
| 4 | Linear Algebra and its Applications | Gilbert Strang | 4th Ed., 2022. | Cengage Publications |
| 5 | Linear Algebra Done Right | Sheldon Axler | 4 th Ed., 2024 | Springer |
| VII(c): Web links and Video Lectures (e-Resources): | | | | |
| 5. http://nptel.ac.in/courses.php?disciplineID=111 6. http://www.class-central-central.com/subject/math(MOOCs) 7. http://academicarth.org/ 8. VTU EDUSAT programme | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Assignments / Presentation/ Quiz. | | | | |

| | | | | | |
|---|----------|--------------|----------|--------------|---------|
| Semester: | IV | Course Type: | PCC | | |
| Course Title: Electric Motors | | | | | |
| Course Code: | 23EET402 | | Credits: | | 3 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| <ul style="list-style-type: none">Aims in imparting fundamental knowledge of construction, types of electric motors.Operation of AC motors and DC motors required for electrical engineers. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk methodPower point presentation / keynotesVideosAnimations | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1: DC Motor and Testing | | | | | 8 Hrs |
| DC Motors: Introduction, Classification, Back emf, Principle of operation, Torque equation, Types, characteristics, Losses, power flow diagram, efficiency, condition for maximum efficiency, Speed control and starters. Numerical. | | | | | |
| DC Motor Testing: Swinburne's Test, Hopkinson's Test, Field Test and Numerical. | | | | | |
| Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part I: Sections 8.1-8.4, 8.7, 8.10, 8.12 to 8.15, 8.17 to 8.21, 8.25, 9.1 to 9.5, 10.1 to 10.5, 10.7, 10.8, 10.10. | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Faraday's Laws of Electromagnetic Induction, Lenz's Law. | | | | | |
| RBT Levels: L1, L2, L3 | | | | | |
| Module-2: Three Phase Induction Motor | | | | | 8 Hrs |
| Three Phase Induction Motor: Types, Construction, Working Principle, Applications, Slip, significance of slip, Torque equation, Maximum torque, Torque-slip and torque-speed curves, torque-slip characteristic covering motoring, generating and braking regions of operation, Losses, efficiency and Numerical. | | | | | |
| Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part I: Section Part III: Section 7.1 to 7.11, 7.18 to 7.23. | | | | | |
| Pre-requisites (Self Learning): | | | | | |
| Electromagnetic Fields, Electric Circuits Analysis, Basics of Electrical and Electronics Engineering | | | | | |
| RBT Levels: L1, L2, L3 | | | | | |
| Module-3: Performance Analysis of Three Phase Induction Motor | | | | | 8 Hrs |
| Performance Analysis of Three Phase Induction Motor: No-load and blocked rotor tests, Performance Analysis of induction motor-Equivalent Circuit & Circle Diagram, Induction motor working as induction generator, Cogging and crawling. High torque rotors-double cage and deep rotor bars. | | | | | |
| Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part III: Section7.26 to 7.29,7.31 to 7.32, 7.35, 7.40, 9.1 | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|-------|----|----|
| Pre-requisites (Self Learning): Electromagnetic Fields, Electric Circuits Analysis. | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | |
| Module-4: Starting and Speed Control of 3 ϕ & 1 ϕ Induction Motor | | | | | | | | | | | | | | 8 Hrs | | |
| Starting Methods and Speed Control of 3 phase Induction motor: Need for starter. Direct online, Star-Delta, and autotransformer starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods. Single Phase Induction Motor: Double revolving field theory, Types, Construction, Working principle, Applications, AC Series Motor. | | | | | | | | | | | | | | | | |
| Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part III: Section: 8.1 to 8.3. Electric Machines, Ashfaq Husain: Chapter 8: Section 8.1 to 8.4, 8.7,8.10 to 8.18 | | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Faraday's Laws of Electromagnetic Induction, Induction Motor working | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | |
| Module-5: Special Machines and applications. | | | | | | | | | | | | | | 8 Hrs | | |
| Synchronous Motor: Working Principles, Starting Methods, Applications, Voltage and Power Factor control, V and inverted V curves, PMSM Special Machines: Linear Induction Motor, AC and DC Servo Motor, Brushless DC motor, Stepper motors, SRM. | | | | | | | | | | | | | | | | |
| Textbook: Chapter: sections: Theory & performance of Electrical Machines, J B Gupta: Part III: Section 5.1, 5.2,5.5,5.13,5.19,5.20,5.25, 9.3, 10.23.3 Part I: Section 11.12 Electrical Machines, Ashfaq Husain: chapter 9: section 9.1-9.2, 9.4-9.9 | | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Faraday's Laws of Electromagnetic Induction | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | | |
| On the successful completion of the course, students will be able to | | | | | | | | | | | | | | | | |
| CO1 | Explain the construction, principle of operation of various types of AC motors, DC motors and special purpose motors. | | | | | | | | | | | | | | | |
| CO2 | Analyze the characteristics and performance of DC machines at loaded conditions. | | | | | | | | | | | | | | | |
| CO3 | Explain the starting methods, speed control, and testing of AC &DC Motors | | | | | | | | | | | | | | | |
| CO4 | Determine the performance of AC Motors using different tests | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 3 | 3 | | | | 1 | 1 | 1 | | | | 1 | 1 | 3 | - | - |
| CO2 | 3 | 3 | | | | 1 | 1 | 1 | | | | 1 | 1 | 3 | - | - |
| CO3 | 3 | 3 | | | | 1 | 1 | 1 | | | | 1 | 1 | 3 | - | - |
| CO4 | 3 | 3 | | | | 1 | 1 | 1 | | | | 1 | 1 | 3 | - | - |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure Section 1 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure Section 1 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure Section 1 | | | | | | | | | | | | | | | | |

| VII. Learning Resources | | | | |
|---|--|---------------------------|--------------------------------|------------------------------|
| VII(a): Textbooks: | | | | |
| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
| 1 | Theory of Performances of Electrical Machines' | Gupta.J.B | 14 th Edition, 2013 | Kataria & Sons |
| 2 | Electric Machines | Ashfaq Husain | 2 nd Edition 2008 | Dhanpat Rai & Co. |
| VII(b): Reference Books: | | | | |
| 1 | A Textbook of Electrical Technology | B.L.Theraja | Reprint Edition 2014 | S Chand and Company |
| 2 | Basic Electrical Engineering | D.P. Kothari | 4th Edition,2019 | McGraw-Hill Education |
| VII(c): Web links and Video Lectures (e-Resources): | | | | |
| Mention the links of the online resources, video materials, etc. https://youtu.be/qZaB6par1zI https://youtu.be/VczIcTD9mTo https://youtu.be/E7jG-m9Kpd8 https://youtu.be/7Wzw04-vmv8 https://youtu.be/ijbZS1kBnSk | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc | | | | |

| | | | |
|--|-----------------|---------------------|---|
| Semester: | IV | Course Type: | IPCC |
| Course Title: Microcontrollers | | | |
| Course Code: | 23EEI403 | Credits: | 4 |
| Teaching Hours/Week (L:T:P:O) | | 3:0:2:0 | Total Hours: 40(Theory)+ 14(Lab Slots) |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | | Theory | Exam Hours: 3 Hours |
| I. Course Objectives: | | | |
| <ul style="list-style-type: none"> To explain the internal organization and working of Computers, microcontrollers, and embedded processors To understand the architecture and working of 8051 microcontrollers To explain different addressing modes of 8051, data types & instruction sets To program the microcontroller in assembly and C language to satisfy the requirements. To be able to interface and operate external peripheral using microcontroller | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| <ul style="list-style-type: none"> Chalk and talk method Power point presentation / keynotes Videos Animations Experiential & self-learning | | | |
| III. COURSE CONTENT | | | |
| III(a). Theory PART | | | |
| Module-1: Introduction to Microcontrollers | | | 8: Hrs |
| <p>Introduction: Introduction to Microprocessor and Microcontroller, Architecture of Microprocessor -Von Neumann and Harvard architecture – CISC and RISC —Comparison of Microprocessor and Microcontroller. Introduction to 8051 microcontrollers, 8051 Architecture- programming model, 8051 Pin diagram details, Clock circuit, Port circuits.</p> <p>Self study: Evolution of Microprocessor and Micro controllers.</p> <p>Textbook: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter: 1: Section 0.1, 0.2, 0.3, 1.1</p> <p>The 8051 Microcontroller, Architecture- Kenneth .J. Ayala: Chapter 1: Section: 1.0 to 1.6</p> | | | |
| <p>Pre-requisites (Self Learning) Knowledge on digital circuits, personal computers, Home appliances</p> | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-2: 8051 Microcontroller | | | 8 Hrs |
| <p>Internal Memory Organization of 8051 Internal RAM structure- 8051 Register Banks and Stack, Timing Diagram, Counters/Timers , Interrupts , Serial port, Special Function Registers, PSW, DPTR & PC, , IO Port Usage in 8051, Port declaration , External memory access.</p> <p>Textbook: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter 2 : section 2.1 to 2.7</p> | | | |
| <p>Pre-requisites (Self Learning): Types of memory, ALU & CU, Knowledge on Bits, Bytes, KB, MB</p> | | | |

| RBT Levels: L1, L2, L3 | |
|---|---|
| Module-3: 8051 Assembly Language Programming | 8 Hrs |
| 8051 Assembly Language Programming: Introduction to assembly language programming, Assembler, Assembling and running an 8051 program, addressing modes, Assembler directives, Instruction set of 8051, Basic Assembly language Programming – Arithmetic operations, logical operations, Looping, Jump, subroutines – IO port programming. Textbook: Chapter: sections: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter 5 & 6: section: 5.1 to 5.4 and section 6.1 to 6.5 | |
| Pre-requisites (Self Learning): Basic mathematical operations, Logic and analytical thinking | |
| RBT Levels: L1, L2, L3 | |
| Module-4:8051 C Programming & Interfacing | 8 Hrs |
| 8051 Embedded 'C' Programming: Compiler, compiling and running an 8051 program, Embedded C Data types, Programming structure- reading and writing data from/ to parallel ports, serial ports, Timer/Counter 8051 Interfacing with peripherals using Embedded 'C', DAC, ADC. Matrix Keyboard, LCD, LED will be discussing in Lab session Textbook: The 8051 Microcontroller and Embedded Systems- Muhammad Ali Mazidi: Chapter 7, 9, 10, 12, 13: section: 7.1 to 7.6, 9.1 to 9.3, 10.1 to 10.5, 12.1 to 12.2 and 13.1 to 13.3. | |
| Pre-requisites (Self Learning): Basics of C language, flow charts and algorithms | |
| RBT Levels:L1, L2, L3 | |
| Module-5: Advanced Microcontrollers | Hrs |
| Introduction to advanced microcontrollers: Introduction to programming languages- Assembly language, Embedded C, HDL, Overview of 8/16/32/64-bit Microprocessors and Microcontrollers – Applications of Microprocessors and Microcontrollers. PIC microcontroller framework, PIC development tools PIC 16F877 microcontroller,- Architecture, Pi diagram, Timers. Textbook: Chapter: sections: Design with PIC Microcontrollers-John B.Peatman: Chapter 1, 6, 9, 10 | |
| Pre-requisites (Self Learning): Interfaces, Timers and counters, memory organisation | |
| RBT Levels: L1, L2, L3 | |
| III(b). PRACTICAL PART | |
| Sl. No. | Experiments / Programs / Problems (insert rows as many required) |
| 1 | Write and Verify ALP - Data transfer Program for block data movement without overlap, exchange, sorting, finding largest element in an array. |
| 2 | Write and verify arithmetic programs to illustrate Arithmetic instructions: Addition, subtraction, multiplication and division, Find square and cube of numbers |
| 3 | Write a program to implement Counters- Hexa & Decimal- Up and Down counter |
| 4 | Write a program to convert data - BCD to ASCII, ASCII to BCD, ASCII to decimal |
| 5 | Write a program to add and subtract multibyte numbers |
| 6 | Write 8051 C Program to interface Stepper motor interface and rotate it clockwise and counter clockwise |
| 7 | Write 8051 C Program to interface DC motor interface for speed control |

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|---|--|---|---|---|---|---|----------------------|---|---|----|----|-----------------------------|----|----|----|----|
| 8 | Write 8051 C Program to interface DAC and generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface | | | | | | | | | | | | | | | |
| Additional Experiments | | | | | | | | | | | | | | | | |
| 1 | Auto Intensity Control of Street Lights. | | | | | | | | | | | | | | | |
| 2 | Application of Delay using 8051 Timers | | | | | | | | | | | | | | | |
| Instructions for conduction of practical part: Refer Annexure Section 1 | | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | | |
| CO1 | Understand the architectural details of microcontrollers and understand instruction set. | | | | | | | | | | | | | | | |
| CO2 | Develop assembly and C language programs to demonstrate the functions of microcontrollers. | | | | | | | | | | | | | | | |
| CO3 | Design and apply the knowledge of on-chip peripherals and also to interface external hardware to microcontroller. | | | | | | | | | | | | | | | |
| CO4 | Understand the advanced microcontrollers available and utilize them for applications | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 3 | 2 | 2 | | | | | | | | | | | | 3 | |
| CO2 | 3 | 2 | 3 | 2 | 2 | | | | 2 | | | 2 | | | 3 | |
| CO3 | 3 | 2 | 3 | 2 | 2 | | | | 2 | | | 2 | | | 3 | |
| CO4 | 3 | 2 | 3 | 2 | 2 | | | | 2 | | | 2 | | | 3 | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure Section 2 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure Section 2 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure Section 2 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(a): Textbooks: | | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | Name of the author | | | | | Edition and Year | | | | | Name of the publisher | | | | |
| 1 | The 8051 Microcontroller and Embedded Systems | Muhammad Ali Mazidi, Janice Gillispie Mazidi, and Rolin D. McKinlay | | | | | Second edition, 2005 | | | | | Pearson Education, Inc | | | | |
| 2 | The 8051 Microcontroller, Architecture, | Kenneth .J. Ayala | | | | | third edition, 2004 | | | | | Penram International, India | | | | |
| 3 | Design with PIC Microcontrollers | John B.Peatman | | | | | 2002 | | | | | Pearson Education | | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | | |
| 1 | Microprocessors and Microcontrollers” | N.Senthil kumar, M.Saravanan, S.Jeevanandhan | | | | | 2010 | | | | | Oxford university press | | | | |
| 2 | Microcontrollers- Theory and applications | Ajay V.Deshmukh | | | | | 2005. | | | | | Tata McGraw-Hill, publisher | | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |

1. <https://www.youtube.com/@eeedepartment4878>
2. <https://www.youtube.com/@VTUeShikshanaProgramme>
3. [NPTEL :: Electrical Engineering - NOC:Microprocessors And Microcontrollers](#)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Mention suggested Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

| | | | |
|---|-----------------|---------------------|-------------------------|
| Semester: | IV | Course Type: | IPCC |
| Course Title: Transmission & Distribution | | | |
| Course Code: | 23EEI404 | Credits: | 04 |
| Teaching Hours/Week (L:T:P:O) | 3:0:2:0 | Total Hours: | 40 +12 Lab Slots |
| CIE Marks: | 50 | SEE Marks: | 50 |
| SEE Type: | Theory | Exam Hours: | 3Hrs |
| I. Course Objectives: | | | |
| <ul style="list-style-type: none"> • This course discusses on • The insulators used for the overhead lines along with the string efficiency and methods to improve it. • Mechanical design of transmission lines including the sag and tension calculations, wind and ice loadings, insulated cables including the grading and calculation of capacitances in single core and three core cables. • The fundamental concepts and detailed calculations of line parameters such as inductances and capacitances, performance analysis of the overhead lines with different equivalent models used for the calculation of regulation and efficiency. • Analysis of Ac distribution with concentrated load and AC interconnected systems • Transmission and distribution age of electrical equipment and life extension techniques. | | | |
| II. Teaching-Learning Process (General Instructions): | | | |
| <ul style="list-style-type: none"> • Chalk and talk method • Power point presentation / keynotes • Videos • Animations • Experiential & self learning | | | |
| III. COURSE CONTENT | | | |
| III(a). Theory PART | | | |
| Module-1: Transmission & Distribution Systems | | | 10 Hrs |
| <p>Standard voltages for generation, transmission and distribution. Advantages of high voltage transmission. Feeders, distributors & service mains. Mechanical design of Transmission Lines- Types of conductors, conductor materials, Calculation of sag in conductors i) At equal supports ii) At different level supports. Effect of ice covering and wind pressure, factors affecting sag, Numerical. Overhead Line Insulators-Types of insulators, potential distribution over a string of suspension insulators. String efficiency & methods of improving string efficiency. Numerical.</p> <p>Textbook: A Course in Power Systems, J B Gupta, Chapter: Part II -2,3, Sections: 2.1 to 2.9 & 3.1 to 3.8</p> <p>Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory</p> | | | |
| RBT Levels: L1, L2, L3 | | | |
| Module-2: Underground Cables & Corona | | | 10 Hrs |
| <p>Underground Cables: General construction of a cable, classification of cables, material used, expression for insulation resistance of a single core cable, dielectric stress in a single core cable, grading of cables, capacitance grading, intersheath grading, measurement of capacitance of a three core cable, determination of maximum current carrying capacity of underground cables. Numerical.</p> | | | |

Corona: -Phenomena, disruptive and visual critical voltages, corona loss. Advantages and disadvantages of corona. Methods of reducing corona. Numerical.

Textbook: Principles of Power System, V.K Mehta, Rohith Mehta, A Course in Power Systems, J B Gupta, Chapter: 11 sections: 11.1 to 11.16 & Chapter: Part II -4 sections: 4.1 ,4.2, 4.6 to 4.9

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-3: Line parameters

10 Hrs

Line Parameters-Calculation of inductance of single phase, 3 phase line with equilateral & unsymmetrical spacing (transposed), calculation of capacitance of a single-phase line and 3 phase line with symmetrical and unsymmetrical spacing (transposed) without considering the effect of earth on transmission line capacitance, Numerical.

Textbook: A Course in Power Systems, J B Gupta

Chapter: Part II - 5 sections: 5.5 to 5.13

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-4: Performance of Transmission Lines

10 Hrs

Performance of Transmission Lines: Classification of lines, Short Transmission lines, medium Transmission lines - nominal T method, nominal π method, numerical, long transmission lines – Rigorous solution method (excluding numerical), ABCD constants of Transmission lines, calculation of voltage regulation and transmission efficiency. Numerical.

Textbook: A Course in Power Systems, J B Gupta

Chapter: Part II -6 sections: 6.1 to 6.10

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

Module-5: AC Distribution, Aging and life extension techniques in Transmission & distribution.

10 Hrs

AC Distribution: Introduction, AC distribution with concentrated loads, AC interconnected systems. Numerical.

Aging and life extension techniques in Transmission & Distribution

Estimation of electrical equipment lifetime, overloading and estimated life of electrical equipment-circuit breakers, transformers, conductors, underground transmission. Temperature and estimated life of electrical equipment, Aging factors, Aging of conductors & insulation.

Textbook:

1. A Course in Power Systems, J B Gupta, Chapter: Part II -9 &10, Sections: 10.1 to 10.4

2. Electrical power transmission and distribution ageing and life extension techniques- Bella H Chudnovsky, Chapter: 6, Sections: 6.1 to 6.1.3 , 6.2.1 to 6.4.2.

Pre-requisites (Self Learning): Knowledge of Basic Electrical Engineering, Field Theory

RBT Levels: L1, L2, L3

III(b). PRACTICAL PART

1. Design and Analysis of sag in conductors at different level supports.

2. Design and Analysis of sag on effect of ice covering and wind pressure.

3. Analysis of string Efficiency based on number of insulator connected.

4. Determine the insulation resistance and capacitance in underground single core cable.

5. To determine the visual critical voltage along the line conductors.

| |
|--|
| 6. Design of short transmission line Model . |
| 7. Determine the ABCD Transmission line parameters. |
| 8. Performance analysis of T/ π method medium transmission line. |
| Simulation using SCI lab/MATlab |

IV. COURSE OUTCOMES

| | |
|------------|--|
| CO1 | Select a suitable insulator & design the transmission line for the required sag and methods to improve string efficiency. |
| CO2 | Develop a mathematical model of the transmission line with different configurations and determine the parameters to analyse its performance. |
| CO3 | Explain Construction of cables, types, specifications, classification, grading and limitations. |
| CO4 | Comprehend the phenomenon of corona, its effects and methods of reducing. |
| CO5 | Explain the AC distribution with concentrated loads and interconnected systems |
| CO6 | Understand the aging factors and life extension techniques of electrical materials and equipment. |

V. CO-PO-PSO MAPPING

| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
|--------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| CO1 | 3 | 2 | 2 | | 2 | 1 | | | | | | 1 | 3 | 2 | | |
| CO2 | 3 | 2 | 2 | | 2 | 1 | | | | | | 1 | 3 | 2 | | |
| CO3 | 3 | 2 | 2 | | 2 | 1 | | | | | | 1 | 3 | 2 | | |
| CO4 | 3 | 2 | | | | 1 | 1 | | | | | 1 | 3 | 2 | | |
| CO5 | 3 | 2 | 2 | | | 1 | 1 | | | | | 1 | 3 | 2 | | |
| CO6 | 3 | 2 | | | | 1 | 1 | | | | | 1 | 3 | 2 | | |

VI. Assessment Details (CIE & SEE)

General Rules: Refer Annexure section 2

Continuous Internal Evaluation (CIE): Refer Annexure section 2

Semester End Examination (SEE): Refer Annexure section 2

VII. Learning Resources

VII(a): Textbooks:

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---------|---|-----------------------------------|------------------|-----------------------|
| 1 | A Course in Power Systems | J B Gupta | 2008 | Katson |
| 2 | Electrical Power Transmission and Distribution | S. Sivanagaraju and Satyanarayana | 2009 | Pearson |
| 3 | Transmission and Distribution of Electrical Power | J.B.Gupta, S.K.Kataria | 2010 | PHI Learning Pvt.Ltd. |
| 4 | Principles of Power System | V.K Mehta Rohith Mehta | 2020 | S. Chand |

VII(b): Reference Books:

| | | | | |
|---|-----------------------------------|---------------|-------------------------------|-------------------------|
| 5 | Elements of Power System Analysis | W.D Stevenson | 1994 | Mc. Graw Hill Comp.Ltd. |
| 6 | Electric Power Generation | Dr. S.N Singh | 2 nd Edition, 2010 | PHI Learning Pvt.Ltd. |

| | | | | |
|--|------------------------------|------------|-------------------------------|----------------------------------|
| | Transmission & Distribution. | | | |
| 7 | Electric Power Systems | C L Wadhwa | 6 th Edition, 2013 | New Age International Publishers |
| VII(c): Web links and Video Lectures (e-Resources): | | | | |
| a. NPTEL courses in Electrical Engineering: Power system generation, Transmission & distribution: Video Lecture Numbers:10,11,12,13, 18,19,20,23 by Prof .D. P. Kothari, Centre for Energy Studies ,IIT New Delhi. | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | |
| Seminars, assignments, quiz, industry visits. | | | | |

| | | | | | |
|---|---|--------------|----------|--------------|--------------|
| Semester: | IV | Course Type: | PCCL | | |
| Course Title: Electrical Machines lab-2 | | | | | |
| Course Code: | 23EEL405 | | Credits: | | 1 |
| Teaching Hours/Week (L:T:P:O) | | | 0:0:2:0 | Total Hours: | 12 lab slots |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Laboratory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| Aims in imparting practical exposure to the students to: <ul style="list-style-type: none">Understand the fundamental concepts of AC & DC motors.Differentiate direct and indirect testing methodsAnalyse the motors performance and characteristics under different loading conditions.Control the speed of DC shunt motor. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk methodHands-on sessionsExperiential learning | | | | | |
| III. COURSE CONTENT | | | | | |
| Sl. No. | Experiments | | | | |
| 1. | Determine the Armature and Field winding resistance of Shunt and Series motors. | | | | |
| 2. | Perform Load test on DC shunt motor to draw speed–torque and horse power–efficiency characteristics. | | | | |
| 3. | Conduct Field Test on DC series machines. | | | | |
| 4. | Conduct Swinburne's Test on DC motor. | | | | |
| 5. | Perform Regenerative test on DC shunt machines. | | | | |
| 6. | Perform Load test on three phase induction motor | | | | |
| 7. | Conduct No-load and Blocked rotor test on three phase induction motor to draw circle diagram. Determination of performance parameters at different load conditions. | | | | |
| 8. | Conduct Load test on single phase induction motor to draw output versus torque, current, power and efficiency characteristics. | | | | |
| 9. | Conduct No-load and Blocked rotor test on three phase induction motor to draw equivalent circuit. Determination of performance parameters at different load conditions. | | | | |
| 10. | Conduct suitable tests to draw the equivalent circuit of single-phase induction motor and determine performance parameters. | | | | |
| 11. | Control the Speed of DC shunt motor by armature and field control using simulation package | | | | |
| 12. | Conduct an experiment to draw V and Inverted V curves of synchronous motor at no load and load conditions using simulation package. | | | | |
| IV. COURSE OUTCOMES | | | | | |
| On the successful completion of the course, students will be able to | | | | | |
| CO1 | Test DC machines to determine their characteristic, to monitor efficiency and also to control the speed of DC motor. | | | | |
| CO2 | Pre-determine the performance characteristics of DC machines by conducting suitable tests. | | | | |

| | | | | | | | | | | | | | | | | |
|--|--|---|---|--------------------|---|---|---|---|--------------------------------|----|----|----|-----------------------|----|----|--|
| CO3 | Perform load test on single phase and three phase induction motor to assess its performance. | | | | | | | | | | | | | | | |
| CO4 | Obtain the characteristics of Synchronous motor experimentally | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | |
| CO1 | 3 | 2 | 1 | | 2 | | | | 2 | 2 | | 1 | 1 | 3 | - | |
| CO2 | 3 | 2 | 1 | | | | | | 2 | 2 | | 1 | 1 | 3 | - | |
| CO3 | 3 | 2 | 1 | | | | | | 2 | 2 | | 1 | 1 | 3 | - | |
| CO4 | 3 | 2 | 1 | | 2 | | | | 2 | 2 | | 1 | 1 | 3 | - | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure Section 4 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure Section 4 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure Section 4 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(a): Textbooks: | | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | | Name of the author | | | | | Edition and Year | | | | Name of the publisher | | | |
| 1 | Theory of Performances of Electrical Machines' | | | Gupta.J.B | | | | | 14 th Edition, 2013 | | | | Kataria & Sons | | | |
| VII(b): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |
| Mention the links of the online resources, video materials, etc. https://youtu.be/SMhG5iv5rnI https://youtu.be/GF9fEXq5HCA https://youtu.be/mR1OcrUNHYE https://youtu.be/dW5BdkUV7gU https://youtu.be/7dOB5s3gRco https://youtu.be/PAnSiKT4cBM | | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | | |
| Industry visit, self-study activities, group discussions. | | | | | | | | | | | | | | | | |

| | | | | | |
|---|--------|--------------|---------|--------------|---------|
| Semester: | IV | Course Type: | ETC | | |
| Course Title: Power Generation Techniques and Economics | | | | | |
| Course Code: | | 23EEE421 | | Credits: | 3 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| <ul style="list-style-type: none">Study the different types of power generation from Conventional Energy Sources.Acquire the knowledge of basic design principles of hydro, nuclear, gas and steam plants.Learn the importance of Hydrogen energy generation, Piezo electricity generation and its applications.Understand the importance of economic aspects of power generation and also the importance of power factor. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk methodPower point presentationVideosAnimations | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1 : Hydro electric Power Plants | | | | | 8 Hrs |
| Energy Scenario: Introduction to conventional and non-conventional sources of energy, Energy scenario, green-house effect. | | | | | |
| Hydroelectric Power Plants: Merits and demerits of hydroelectric power plants, Selection of site. General arrangement of hydel plant, elements of the plant, Classification of the plants based on water flow regulation, small hydro and pumped storage plants. | | | | | |
| Water turbines – Pelton wheel, Francis and Kaplan turbines. Characteristic of water turbines, selection of water turbines. | | | | | |
| Textbook: Chapter: sections: A course in power systems, J B Gupta: Chapter 1 & 2: Section 1.1 to 2.20. | | | | | |
| Pre-requisites (Self Learning): Knowledge on Conventional & non conventional energy sources. | | | | | |
| RBT Levels: L1, L2 | | | | | |
| Module-2: Thermal Power Plants | | | | | 8 Hrs |
| Steam (Thermal)Power Plants: Introduction, Schematic arrangement and working of steam power plant, Basic Rankine cycle, advantages and disadvantages, choice of site, efficiency of steam power station, fuel and ash handling, draught system, feed water treatment, steam power plant auxiliaries. Scenario of Thermal Energy generation. | | | | | |
| Gas turbine Plants: Introduction, Merits and demerits, site selection, Fuels for gas turbines, Elements of simple gas turbine power plant. | | | | | |
| Textbook: Chapter:sections: A course in power systems, J B Gupta: Chapter 3 and 6: Section 3.1 to 3.20. and Section 6.1 to 6.6. | | | | | |
| Pre-requisites (Self Learning): | | | | | |
| Knowledge on thermal power stations in India. | | | | | |

| | |
|--|--|
| RBT Levels: L1, L2 | |
| Module-3: Nuclear Power Plants | 8 Hrs |
| Nuclear Power Plants: Introduction, Scenario of Nuclear power generation. Basics of nuclear energy conversion, Merits and demerits, selection of site, Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU type Reactor, Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclear power plants, Disposal of nuclear waste. | |
| Textbook: Chapter: sections: A course in power systems, J B Gupta: Chapter 4: Section 4.1 to 4.17. | |
| Pre-requisites (Self Learning): Nuclear Fusion and Fission Reaction theory | |
| RBT Levels: L1, L2 | |
| Module-4: Hydrogen Energy & Piezoelectric Energy Generation. | 8 Hrs |
| Hydrogen Energy Generation: Introduction, benefits, hydrogen production technologies, uses, applications. Piezoelectric Energy: Introduction, Total power production in India, the piezoelectric effect, Characteristics of piezo electricity, Factors leading to requirement of piezo electricity, Important components of piezoelectric tile, Block diagram of piezoelectric tile, applications of piezoelectricity. | |
| Textbook: Chapter: sections: 1. Non-Conventional Energy Resources, Shobhnath singh Chapter 5: Section 5.1,5.2,5.4, 5.5. 2.open access peer-reviewed chapter Piezoelectricity and Its Applications: written by B. Chandra Sekhar, B. Dhanalakshmi, B. Srinivasa Rao, S. Ramesh, K. Venkata Prasad, P.S.V. Subba Rao and B. Parvatheeswara Rao.DOI: 10.5772/intechopen.96154 3.Anand, Hari and Singh, Binod Kumar. "Piezoelectric energy generation in India: an empirical investigation" <i>Energy Harvesting and Systems</i>, vol. 6, no. 3-4, 2019, pp. 69-76. https://doi.org/10.1515/ehs-2020-0002 | |
| Pre-requisites (Self Learning): Piezo electric and its uses | |
| RBT Levels: L1, L2, L3 | |
| Module-5: Power Plant Economics | 8 Hrs |
| Power Plant Economics: Introduction, Classification of costs, Fixed and Operating costs of Hydro, Thermal and Nuclear Plants, Economics of Power generation and associated definitions, Load factor, diversity factor, Numerical. Tariffs, types, types of consumers and their tariff. Power factor, disadvantages and causes of low power factor, methods and advantages of improving power factor improvement, Simple Numerical. | |
| Textbook: Chapter: sections: A course in power systems, J B Gupta: Chapter 14 and 15: Section 14.1 to 14.10 and Section 15.1 to 15.12. | |
| Pre-requisites (Self Learning): Knowledge on Tariff and costs of power generation. | |
| RBT Levels: L1, L2,L3 | |
| IV. COURSE OUTCOMES | |
| | |
| At the end of the course students will be able to | |
| CO1 | Describe the working of hydroelectric power plant, types and the role of turbines in hydro power generation. |
| CO2 | Explain the working of thermal power plant, components, layout and environmental issues associated. |
| CO3 | Discuss the working of nuclear power plants, types of reactors and environmental societal issues. |
| CO4 | Learn the importance of hydrogen energy & Piezo electricity generation and its applications. |
| CO5 | Discuss the importance of economics in power generation and need of power factor improvement. |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | |

| | | | | | | | | | | | | | | | |
|---|--|---|--|---|--------------------------------|---|---|---|---|----|----|----|----|----|----|
| PO/PS O | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 |
| CO1 | 3 | | | | | 2 | 2 | | | | | 1 | 3 | | |
| CO2 | 3 | | | | | 2 | 2 | | | | | 1 | 3 | | |
| CO3 | 3 | | | | | 2 | 2 | | | | | 1 | 3 | | |
| CO4 | 3 | | | | | 2 | 2 | | | | | 1 | 3 | | |
| CO5 | 3 | 2 | | | | 2 | 2 | | | | | 1 | 3 | | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure Section 1 | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure Section 1 | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure Section 1 | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | |
| VII(a): Textbooks: | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | Name of the author | | Edition and Year | | Name of the publisher | | | | | | | | |
| 1 | A course in power systems | | J B Gupta | | 11 th Edition, 2019 | | S.K.kataria& Sons. | | | | | | | | |
| 2 | Power system Engineering | | A Chakrabarti, M.L.Soni, P.V.Guptha & U.S. Bhatnagar | | First Edition, Reprint 2017. | | Dhanpat rai & co. (pvt.) Ltd. | | | | | | | | |
| 3 | Non-Conventional Energy Resources | | Shobh Nath Singh | | First Edition, 2015 | | Pearson India Education Services Pvt Ltd. | | | | | | | | |
| VII(b): Reference Books: | | | | | | | | | | | | | | | |
| 1 | Power Plant Engineering | | P.K.Nag | | Third Edition 2012. | | McGraw-Hill Education | | | | | | | | |
| 2 | Electrical power Generation, Transmission and Distribution | | S.N.Singh | | 2 nd Edition, 2009 | | PHI Publications. | | | | | | | | |
| 3 | Generation of Electrical Energy S. Chand 2015 | | B.R.Gupta | | 7 th Edition,2017 | | S.Chand Publishers. | | | | | | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | |
| Mention the links of the online resources, video materials, etc. | | | | | | | | | | | | | | | |
| (1) Power Plant Engineering - YouTube | | | | | | | | | | | | | | | |
| (2) (1) Electrical - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video) - YouTube | | | | | | | | | | | | | | | |
| (3) POWER PLANT ENGINEERING (mheducation.com) | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | |
| Assignments, quiz, case studies, mini projects, industrial visit. | | | | | | | | | | | | | | | |

| | | | | | |
|--|--------|--------------|---------|--------------|-------|
| Semester: | IV | Course Type: | ETC | | |
| Course Title: Introduction to Electric Vehicle Technology | | | | | |
| Course Code: | | 23EEE422 | | Credits: | 3 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 |
| I. Course Objectives: | | | | | |
| This course will enable students to: <ul style="list-style-type: none">To understand the Electric vehicles and Hybrid vehicles components & function.Understand types of Batteries used as an energy source recently.Understand the electric propulsion and its control for application of EV.Ability to understand Electric Vehicle Charging Infrastructure, Standards. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk methodPower point presentationVideosAnimations | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1:Introduction to Electric Vehicles | | | | | 8 Hrs |
| Introduction to Electric vehicles, Introduction to Hybrid vehicles, Electric & Hybrid Vehicles Components, Limitations of IC engine vehicles, Electric vehicles overview, Types of EV & challenges, History of Electric vehicles ,Advantages of Electric vehicles, Electric vehicles & ICEV Comparison, General block diagram of Electric Vehicles, Performance of Electric vehicles, Introduction to Electric vehicles motors drive technology. | | | | | |
| TextBook:Chapter:Sections-‘Electric and Hybrid Vehicles : Design Fundamentals, IqbalHussein, :Chapter-1:Section 1.1to 1.8,10.1. | | | | | |
| Prerequisites(Self Learning): Basics of Electrical Engg ,Physics fundamentals. | | | | | |
| RBT Levels: L1, L2. | | | | | |
| Module-2: Vehicle Architecture and Design | | | | | |
| Electric Vehicles, HEV, Hybrids based on Architecture, Hybrids based on Transmission assembly, Hybrids based on degree of Hybridization, Plug-in Hybrid Electric vehicles, EVs: skateboard Chassis, Power train component sizing, HEV Power train Sizing. | | | | | |
| TextBook:Chapter:Sections-‘Electric and Hybrid Vehicles : Design Fundamentals, Iqbal Hussein, :Chapter-3:Section 3.1 to 3.5.2 | | | | | |
| Prerequisites(Self Learning): Fundamentals knowledge on EV configuration. | | | | | |
| RBT Levels:L1, L2, L3 | | | | | |
| Module-3: Battery Energy storage | | | | | 8 Hrs |
| Batteries in Electric and Hybrid Vehicles, Battery Basics, Battery Parameters. Traction Batteries-types: Lead Acid batteries, Nickel-cadmium (NiMH)battery, Li-ion Battery. Battery Pack management. | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|-------|----|--|
| TextBook:Chapter:Sections-‘Electric and Hybrid Vehicles : Design Fundamentals, Iqbal Hussein : Chapter-5:Section 5.1 to 5.3, 5.6.1 to 5.6.5, 5.7 | | | | | | | | | | | | | | | | |
| Prerequisites (Self Learning): Basic knowledge on Electrolysis. | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2. | | | | | | | | | | | | | | | | |
| Module-4: Electric Propulsion | | | | | | | | | | | | | | 8 Hrs | | |
| Introduction, Types of motors used in Electric Vehicles: DC Series motor, Brush-less-DC-Motor(BLDC), Three phase-Induction machines, Permanent Magnet machines, Switched Reluctance machines(SRM); Each motors working principles, Characteristics, Applications & its limitations. | | | | | | | | | | | | | | | | |
| TextBook:Chapter:Sections-‘Electric and Hybrid Vehicles : Design Fundamentals, Iqbal Hussein : Chapter-7: Sections-7.1 to 7.7 | | | | | | | | | | | | | | | | |
| Prerequisites(Self Learning): Working principles of different Machines. | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | |
| Module-5: Electric Vehicle Charging Infrastructure. | | | | | | | | | | | | | | 8 Hrs | | |
| Introduction, Electric Vehicle Charging Station Infrastructure, Standards for EV Charging, Types of EV Charging Systems, Nature of Electric Vehicles Load, Impact of Electric Vehicles on the Electric Power Grid. | | | | | | | | | | | | | | | | |
| TextBook:Chapter:Sections : “Electric Vehicle Charging Infrastructure, Standards, Types, and Its Impact on Grid”:A Review by-P. Bhosale,Sujil A,Rajesh Kumar &R. C. Bansal, LLCISSN: 1532-5008 print / 1532-5016, onlineDOI:10.1080/15325008.2024.2315206 Published online: 10 Apr 2024. | | | | | | | | | | | | | | | | |
| Prerequisites(Self Learning): Knowledge on charging methods. | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2. | | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | | |
| CO1 | Explain the working of electric vehicles, Hybrid EVs & recent trends. | | | | | | | | | | | | | | | |
| CO2 | Discuss the various configuration of electric vehicle architecture & design. | | | | | | | | | | | | | | | |
| CO3 | Discuss different methods available for energy storage for EV applications. | | | | | | | | | | | | | | | |
| CO4 | Explain the electric propulsion units and its control for application of electric vehicles. | | | | | | | | | | | | | | | |
| CO5 | Understand the electrical vehicle charging station infrastructure standards and types, along with the impact on grid. | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING(mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | |
| CO1 | 2 | | | | | 2 | 2 | | | | | 1 | | 2 | 2 | |
| CO2 | 3 | | | | | 3 | 3 | | | | | 1 | | 3 | 3 | |
| CO3 | 2 | | | | | 2 | 2 | | | | | 1 | | 2 | 2 | |
| CO4 | 2 | | | | | | | | | | | 1 | | 3 | 3 | |
| CO5 | 3 | | | | | 3 | 3 | | | | | 1 | | 3 | 3 | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure Section 1 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure Section 1 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure Section 1 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |

VII(a): Textbooks:

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---------|---|--|------------------|-----------------------------------|
| 1 | 'Electric and Hybrid Vehicles: Design Fundamentals', | Iqbal Hussein, | 2003. | CRC Press Taylor & Francis Group, |
| 2 | Modern Electric, 'Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design', | Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, | 2004. | CRC Press Taylor & Francis Group, |

VII(b): Reference Books:

| | | | | |
|---|--|-------------------------------------|-------|--------------------|
| 1 | Hybrid Electric Vehicles: Energy Management Strategies | S. Onori, L. Serrao and G. Rizzoni, | 2015 | Springer, |
| 2 | Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, | C. Mi, M.A.Masrur and D. W.Gao | 2011. | John Wiley & Sons, |

VII(c): Web links and Video Lectures (e-Resources):

VTU EDUSAT programme

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Assignments / Presentation/ Quiz.

| | | | | | |
|--|----------|--------------|----------|--------------|---------|
| Semester: | IV | Course Type: | ETC | | |
| Course Title: PLC and Electrical System Automation | | | | | |
| Course Code: | 23EEE423 | | Credits: | | 3 |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| This course will enable students: <ul style="list-style-type: none">To explain identification of common operating modes found in PLCs, writing and entering the ladder logic programs.To define the functions of Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-in circuits and Latching Relays, Timers, Counters.To discuss the operation of various processes, structures of control systems and the method of communication between different industrial processes | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk methodPower point presentation / keynotesVideosField Visit | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1: Basics of PLC Programming | | | | | 8 Hours |
| Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of Operation. | | | | | |
| Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 1, 5: Section 5.1 to 5.10 | | | | | |
| Pre-requisites (Self Learning) Relay Operations. | | | | | |
| RBT Levels: L1, L2 | | | | | |
| Module-2 Developing PLC Wiring Diagrams and Timers | | | | | 8 Hours |
| Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs: Electromagnetic Control Relays, Contactors, Motor Starters, Manually Operated Switches, Mechanically Operated Switches, Sensors, Output Control Devices, Seal-In Circuits, Latching Relays, Converting Relay Schematics into PLC Ladder Programs, Writing a Ladder Logic Program Directly from a Narrative Description. | | | | | |
| Programming Timers: Mechanical Timing Relays, Timer Instructions, On-Delay Timer Instruction, Off-Delay Timer Instruction, Retentive Timer, Cascading Timers. | | | | | |
| Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 6, 7 : Section 6.1 to 6.11 and 7.1 to 7.6 | | | | | |
| Pre-requisites (Self Learning): Sensors, Relay Operation, Timer Concepts | | | | | |

| | | | | | | | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|---|----|----|----|----|---------|----|
| RBT Levels: L1, L2 | | | | | | | | | | | | | | | |
| Module-3: Programming Counters and Control Instructions | | | | | | | | | | | | | | 8 Hours | |
| Programming Counters: Counter Instructions, Up-Counter, Down-Counter, Cascading Counters, Incremental Encoder-Counter Applications, Combining Counter and Timer Functions. Program Control Instructions: Master Control Reset Instruction, Jump Instruction, Subroutine Functions, Immediate Input and Immediate Output Instructions, Forcing External I/O Addresses, Safety Circuitry, Selectable Timed Interrupt, Fault Routine, Temporary End Instruction, Suspend Instruction. | | | | | | | | | | | | | | | |
| Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 8, 9 : Section 8.1 to 8.6 and 9.1 to 9.10 | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Counter Operation, Control Instructions | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2 | | | | | | | | | | | | | | | |
| Module-4: Development of Control Circuit | | | | | | | | | | | | | | 8 Hours | |
| Development Of Control Circuit: Develop ladder diagram for control from one place, remote control, interlocking, DOL starter, Forward and reverse motoring, Automatic star delta starter, 3 speed motor Control, Automatic Plugging, Jogging and sequence speed control, Motor control centre, Thyristor controlled DC Motor Drive and Induction motor drive. | | | | | | | | | | | | | | | |
| Textbook: Chapter: sections: Fundamentals of control, McIntyre and losee: Chapter 10: Section 10.1 to 10.10 | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Motor Control Techniques. | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2 | | | | | | | | | | | | | | | |
| Module-5: Process Control, Network Systems, and SCADA | | | | | | | | | | | | | | 8 Hours | |
| Process Control, Network Systems, and SCADA: Types of Processes, Structure of Control Systems, On/Off Control, PID Control, Motion Control, Data Communications, Supervisory Control and Data Acquisition (SCADA). | | | | | | | | | | | | | | | |
| Textbook: Chapter: sections: Programmable Logic Controllers, Frank D Petruzella: Chapter 14 Section 14.1 to 14.7 | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Control Circuit, SCADA basics | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2 | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | |
| CO1 | Discuss the hardware components of PLC, operating modes and programming, execution of data transfer and PLC closed-loop control system. | | | | | | | | | | | | | | |
| CO2 | Describe field devices Operations on Relays, Contactors, Motor Starters, Switches, Sensors, Output Control Devices, Seal-In Circuits, and Latching Relays, processes and structure of control systems and communication between the processes. | | | | | | | | | | | | | | |
| CO3 | Analyse PLC timer and counter ladder logic programs and describe the operation of different program control instructions | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 |
| CO1 | 3 | 2 | - | - | - | 1 | 1 | 1 | - | - | - | 2 | 2 | 2 | - |
| CO2 | 3 | 2 | - | - | - | 1 | 1 | 1 | - | - | - | 2 | 2 | 2 | - |
| CO3 | 3 | 2 | - | - | - | 1 | 1 | 1 | - | - | - | 2 | 2 | 2 | - |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | |

General Rules: Refer Annexure Section 1

Internal Assessment Test: Refer Annexure Section 1

Semester-End Examination: Refer Annexure Section 1

VII. Learning Resources

VII(a): Textbooks:

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|---------|--------------------------------|--------------------|-------------------|-----------------------|
| 1 | Programmable Logic Controllers | Frank D Petruzella | 4th Edition, 2011 | McGraw Hill |

VII(b): Reference Books: (Insert or delete rows as per requirement)

| | | | | |
|---|---|--------------------|-------------------|-------------|
| 1 | Fundamentals of control | McIntyre and losee | 3rd Edition | McGraw Hill |
| 2 | Introduction Programmable Logic Controllers | Gary Dunning | 3rd Edition, 2006 | Cengage |

VII(c): Web links and Video Lectures (e-Resources):

Mention the links of the online resources, video materials, etc.

https://www.youtube.com/watch?v=PbAGl_mv5XI

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

<https://www.youtube.com/watch?v=LIQ9imlgH-U>

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc

| | | | | | |
|---|----------|---------------------------------------|----------|--------------|---------|
| Semester: | IV | Course Type: | ETC | | |
| Course Title: | | Object Oriented Programming with JAVA | | | |
| Course Code: | 23EEE424 | | Credits: | 3 | |
| Teaching Hours/Week (L:T:P:O) | | | 3:0:0:@ | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 3 Hours |
| I. Course Objectives: | | | | | |
| This course will enable students to: <ul style="list-style-type: none">Understand about object-oriented programming to Acquire knowledge about the capability to store data together in an object.Develop technique to represent entity as a real time object using Class, object, strings, Inheritance, Packages, and InterfaceStudy about type of functions called constructors and hence to implement exception/ Event handling mechanism.Create and process data in files using file I/O operations. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <ul style="list-style-type: none">Chalk and talk method.Power point presentation / keynotesVideos | | | | | |
| III. COURSE CONTENT | | | | | |
| Module-1: Introduction to Java and Java Evolution | | | | | 8 Hrs |
| Fundamentals of OOP: Introduction, Object-oriented paradigm, Basic concepts of Object-Oriented programming, Benefits of OOP, Applications of OOP Java Evolution: Java History, Java features, how Java differs from C & C++, Java and Internet, Java and World wide web, Web browsers, Hardware and Software requirements, Java support systems, Java environment. | | | | | |
| Textbook: Programming with Java - E Balagurusamy Chapter 1: Section: 1.1,1.2,1.3,1.4 and 1.5 Chapter 2 : Section: 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8 and 2.9 | | | | | |
| Pre-requisites (Self Learning): Structure of any Programming language | | | | | |
| RBT Levels: L1, L2, L3 | | | | | |
| Module-2: Overview of Java Language, Variables and Data types | | | | | 8 Hrs |
| Overview of Java language: Introduction, Simple java program, more of Java, Java programming structure, Java tokens, Java statements, Implementing a Java program, Java virtual Machine, Example Programs Constants, Variables and Data types: Introduction, Constants, Variables, Datatypes, Declaration of a variable, giving values to variables, Scope and Lifetime of variables, Example Programs | | | | | |
| Textbook: Programming with Java-E Balagurusamy Chapter 3: Section: 3.1,3.2,3.4,3.5,3.6,3.7,3.9 and 3.10 Chapter 4 : Section: 4.1,4.2,4.3,4.4,4.5,4.6 and 4.7 | | | | | |
| Pre-requisites (Self Learning): Knowledge in C++ Programming | | | | | |
| RBT Levels: L1, L2, L3 | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|--|---|---|---|---|---|---|---|---|----|----|----|----|-------|----|----|--|
| Module-3: Operators, Decision making & Branching | | | | | | | | | | | | | | 8 Hrs | | | |
| Operators and Expressions: Introduction, Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and decrement operators, conditional operators, Arithmetic Expressions, Evaluation of expressions, Example Programs Decision making and branching: Introduction, Decision making with If statement, If-else statement, Nesting of If_else Statements, The ELSE If ladder, Switch statements, The ?: Operator, Example Programs Textbook: Programming with Java-E Balagurusamy Chapter 5: Section: 5.1,5.2,5.3,5.4,5.5,5.6,5.7,5.8,5.9,5.10 and 5.11 Chapter 6 : Section: 6.1,6.2,6.3,6.4,6.5,6.6,6.7 and 6.8 | | | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Knowledge in C++ Programming | | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | | |
| Module-4: Control flow, Classes, and Methods | | | | | | | | | | | | | | 8 Hrs | | | |
| Decision making and lopping: Introduction, while statement, do statement, for statement, Jumps in Loops, return statement, Labelled loops, Example Programs Classes and Methods: Introduction, defining a class, fields declaration, Methods declaration, creating objects, Accessing class members, Constructors, Destructors, Method overloading, Static members, Nesting of methods, Example Programs. Textbook: Programming with Java-E Balagurusamy Chapter 7: Section: 7.1,7.2,7.3,7.4,7.5,7.6 and 7.7 Chapter 8 : Section: 8.1,8.2,8.3,8.4,8.5,8.6,8.7,8.9 and 8.10 | | | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Knowledge in any of the Programming language | | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | | |
| Module-5: Inheritance and Polymorphism | | | | | | | | | | | | | | 8 Hrs | | | |
| Inheritance: Basics of Inheritance: Member access and Inheritance, A more practical Example, super keyword, Example programs Polymorphism: Method overriding, Dynamic method dispatch: Why overridden methods? Applying method overriding, Introduction to Abstract classes, using final to prevent inheritance, Example programs. Textbook: Java the Complete Reference- Herbert Schildt Chapter 8: Section: Pg. No. 171 to 195 | | | | | | | | | | | | | | | | | |
| Pre-requisites (Self Learning): Knowledge in any of the Programming language | | | | | | | | | | | | | | | | | |
| RBT Levels: L1, L2, L3 | | | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES At the end of the course, students will be able to | | | | | | | | | | | | | | | | | |
| CO1 | Develop JAVA programs using OOP principles and proper program structuring with extensible Class types, User-defined operators, and functions | | | | | | | | | | | | | | | | |
| CO2 | Achieve code reusability and extensibility by means of Inheritance. | | | | | | | | | | | | | | | | |
| CO3 | Analyse the concepts of Polymorphism for effective programming in JAVA | | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (Mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 | |
| CO1 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | | | |
| CO2 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | | | |
| CO3 | 3 | 3 | 2 | | | 2 | | | | | | 2 | 3 | | | | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure Section 1 | | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure Section 1 | | | | | | | | | | | | | | | | | |

Semester End Examination (SEE): Refer Annexure Section 1**VII. Learning Resources****VII(a): Textbooks:**

| Sl. No. | Title of the Book | Name of the author | Edition and Year | Name of the publisher |
|----------------|-----------------------------|---------------------------|-------------------------|------------------------------|
| 1 | Java the Complete Reference | Herbert Schildt | 12th Edition, 2023 | McGraw Hill, Chennai |
| 2 | Programming with Java | E Balagurusamy | 6th Edition, 2019 | McGraw Hill |

VII(b): Reference Books:

| | | | | |
|----------|-----------------------|---------------------------------|---------------------|-------------------------|
| 2 | JAVA One step Ahead | Anita Seth and B L Juneja | 2017 | Oxford University Press |
| 3 | Programming with Java | Mahesh Bhavne and Sunil Patekar | First Edition, 2008 | Pearson Education |

VII(c): Web links and Video Lectures (e-Resources):

[Object Oriented Programming \(OOPs\) Concept in Java - GeeksforGeeks](#)
[The Best Java Examples \(freecodecamp.org\)](#)
[Learn Java Programming \(programiz.com\)](#)

VIII: Activity Based Learning / Practical Based Learning/Experiential learning:

Activities like seminar, assignments, quiz, mini projects, self-study activities, group discussions, Activity Based Learning, Practical Based learning, Project Based learning, Demonstration of simple projects, etc

| | | | | | |
|---|----------|--------------|---------|--------------|-----|
| Semester: | 4 | Course Type: | AEC | | |
| Course Title: Network Security | | | | | |
| Course Code: | 23EEAE41 | | | Credits: | 1 |
| Teaching Hours/Week (L:T:P:O) | | | 1:0:0:3 | Total Hours: | 40 |
| CIE Marks: | 50 | SEE Marks: | 50 | Total Marks: | 100 |
| SEE Type: | Theory | | | Exam Hours: | 2 |
| I. Course Objectives: | | | | | |
| <ul style="list-style-type: none">Understand core security principles: confidentiality, integrity, availability, and non-repudiation.Define and enforce physical security measures at various levels.Identify different types of security policies and controls.Recognize various attack types and vulnerabilities.Understand backup and restore types: full, incremental, and differential.Identify methods for protecting client and server systems.Configure user authentication mechanisms and manage permissions effectively.Implement wireless security measures and network protection devices.Understand network isolation methods and protocol security concepts.Implement email protection measures, manage browser security, and maintain anti-malware software. | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| <p>These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none">Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.Use of Video/Animation to explain functioning of various concepts.Encourage collaborative (Group Learning) Learning in the class.Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analysed information rather than simply recall it.Introduce Topics in manifold representations. | | | | | |

7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

III. COURSE CONTENT

III(a). Theory PART

Module-1: Defence in Depth

Hrs 8

Heading:

1.1 Identify core security principles

- Confidentiality, integrity, availability, non-repudiation, threat, risk, vulnerability, principle of least privilege, attack surfaces including IoT

1.2 Define and enforce physical security

- Site security, computer security, removable devices and drives, mantraps

1.3 Identify security policy types

- Administrative controls, technical controls

1.4 Identify attack types

- Buffer overflow, viruses, polymorphic viruses, worms, Trojan horses, spyware, ransomware, adware, rootkits, backdoors, zero day attacks/ vulnerabilities, denial-of-service (DoS) attacks, common attack methods,

types of vulnerability, cross-site scripting (XSS), SQL injection, brute force attack, man-in-the-middle (MITM) and man-in-the-browser (MITB), social engineering, keyloggers (software and hardware), logic bombs

1.5 Identify backup and restore types

- Full, incremental, differential

Textbook: Chapter: sections

"Principles of Computer Security" by William Stallings and Lawrie Brown: This textbook covers core security principles such as confidentiality, integrity, availability, and non-repudiation. It also delves into topics like threats, risks, vulnerabilities, and the principle of least privilege.

Pre-requisites (Self Learning): Device divers, script language

RBT Levels: L2 & L3

Module-2: Operating System Security

Hrs 8

Heading:

2.1 Identify client and server protection

- Separation of services, hardening, patch management, reducing the attack surface, group policy (gpupdate and gpresult), secure dynamic Domain Name System (DNS) updates, User Account Control (UAC), keeping client operating system and software updated, encrypting offline folders, software restriction policies

2.2 Configure user authentication

- Multifactor authentication, enforcing password policies, remote access, using secondary sign-on to perform administrative tasks (Run As, sudo), domain and local user and group creation, Kerberos

2.3 Manage permissions in Windows and Linux

- File and folder permissions, share permissions, inheritance, moving or copying files within the same disk or on another disk, multiple groups with different permissions, take ownership, delegation.

| | |
|--|--------------|
| Textbook:Chapter:sections "CompTIA Security+ Study Guide: Exam SY0-601" by Emmett Dulaney and Chuck Easttom | |
| Pre-requisites: Security Policy and Types of security policies (Chapter 1) | |
| RBT Levels: L2 & L4 | |
| Module-3: Network Device Security | Hrs 8 |
| Heading: 3: Managing Permissions 3.1 Facilitate non-repudiation using audit policies and log files <ul style="list-style-type: none"> Types of auditing, what can be audited, enabling auditing, what to audit for specific purposes, where to save audit information, reviewing log files 3.2 Demonstrate knowledge of encryption <ul style="list-style-type: none"> File and folder encryption, how encryption impacts moving/copying files and folders, drive encryption, TPM, secure communication processes (email, texting, chat, social media), virtual private network (VPN) encryption methods, public key/private key, certificate properties and services, Bitlocker 3.3. Implement wireless security <ul style="list-style-type: none"> Wireless security types (strength of encryption), service set identifiers (SSIDs), MAC filtering, default configuration (OOBE) 3.2 Identify the role of network protection devices <ul style="list-style-type: none"> Purpose of firewalls, hardware vs. software firewalls, network vs. host firewalls, stateful vs. stateless firewall inspection, security baselines, intrusion detection system (IDS), intrusion prevention system (IPS), security information and event manager (SIEM), content filtering, blacklisting/ whitelisting | |
| Textbook:Chapter:sections "Network Security Essentials: Applications and Standards" by William Stallings” | |
| Pre-requisites : Components used in network, Client and Server protection(Chapter 2). | |
| RBT Levels: L2 & L4 | |
| Module-4: Network Device Security | Hrs 8 |
| Heading: 4.1 Identify network isolation methods <ul style="list-style-type: none"> Routing, honeynet, perimeter networks (DMZ), NAT/PAT, VPN, IPsec, air gap network, DirectAccess, virtual LAN (VLAN) 4.2 Identify protocol security concepts <ul style="list-style-type: none"> Tunneling, DNSSEC, network sniffing, well-known ports (FTP, HTTP, HTTPS, DNS, RDP, Telnet, SSH, LDAP, LDAPS, SNMP, SMTP, IMAP, SFTP) | |
| Pre-requisites: Learning Wireless Technology (Chapter 2) | |
| RBT Levels: L2 & L3 | |
| Module-5: Secure Computing | Hrs 8 |

| Heading: 5.1 Implement email protection • Antispam, spoofing, phishing, and pharming, client protection, user training 5.2 Manage browser security • Browser settings, cache management, private browsing 5.3 Install and configure anti-malware and antivirus software • Installing, uninstalling, reinstalling, and updating; remediation, scheduling scans, investigating alerts. Textbook:Chapter:sections "The Art of Deception: Controlling the Human Element of Security" by Kevin D. Mitnick and William L. Simon | |
|--|--|
| Pre-requisites: Knowledge on Browser usage, email usage & Antivirus. | |
| RBT Levels: L2 & L3 | |
| III(b). PRACTICAL PART (Fill this portion III(b) if course type is integrated or else delete this portion, if course type is only practical, delete the theory part III(a) and retain this section) | |
| Sl. No. | Experiments / Programs / Problems (insert rows as many required) |
| 1. | Experiment 1: Set up a simple network with multiple layers of security (e.g., firewall, antivirus software, access control lists) and simulate various attack scenarios (e.g., DoS attack, malware infection). Observe how each layer of defense reacts to the attacks and mitigates the threats. Experiment 2: Implement backup and restore procedures using different methods (full, incremental, differential) on a test system. Practice restoring data from backups to understand the recovery process. |
| 2. | Experiment 3: Harden a Windows or Linux operating system by implementing security measures such as disabling unnecessary services, configuring firewall rules, enabling UAC (User Account Control), and applying security patches. Test the system's resilience against common attack vectors. Experiment 4: Configure user authentication mechanisms such as multifactor authentication and enforce password policies on a test environment. Explore the implications of different authentication methods on system security. |
| 3. | Experiment 5: Set up a wireless network with various security types (e.g., WPA2-PSK, WPA2-Enterprise) and experiment with SSID hiding, MAC filtering, and encryption strength. Assess the effectiveness of each security measure in preventing unauthorized access. Experiment 6: Configure and deploy network protection devices such as firewalls and intrusion detection/prevention systems (IDS/IPS) in a simulated network environment. Test the devices' functionality by generating and analyzing network traffic. |
| 4. | Experiment 7: Implement email protection measures such as configuring spam filters, setting up SPF/DKIM/DMARC records, and conducting phishing simulation exercises. Evaluate the effectiveness of these measures in detecting and preventing email-based threats. Experiment 8: Explore browser security settings and conduct experiments to understand how to manage cache, cookies, and security certificates. Test the security features of different web browsers and assess their effectiveness in preventing malicious activities. |

| | | | | | | | | | | | | | | | | |
|---|--|---|---|---|---|--|---|---|---|----|---------------------------------|----|-----------------------|----|----|----|
| Experiment 9: Install and configure anti-malware and antivirus software on a test system. Perform malware scanning, schedule regular scans, and analyze scan results. Practice responding to alerts and remediating malware infections. | | | | | | | | | | | | | | | | |
| Instructions for conduction of practical part: | | | | | | | | | | | | | | | | |
| IV. COURSE OUTCOMES | | | | | | | | | | | | | | | | |
| CO1 | Students will understand the concept of defense in depth and its importance in network security. | | | | | | | | | | | | | | | |
| CO2 | Students will be proficient in configuring security settings to minimize vulnerabilities within operating systems. | | | | | | | | | | | | | | | |
| CO3 | Students will gain skills in performing vulnerability assessments and applying patches to network devices. | | | | | | | | | | | | | | | |
| CO4 | Students will understand secure communication protocols and their role in ensuring data confidentiality and integrity. | | | | | | | | | | | | | | | |
| CO5 | Students will be able to configure and manage secure computing environments compliant with relevant standards and regulations. | | | | | | | | | | | | | | | |
| V. CO-PO-PSO MAPPING (mark H=3; M=2; L=1) | | | | | | | | | | | | | | | | |
| PO/PSO | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | S1 | S2 | S3 | S4 |
| CO1 | 2 | | 2 | | 2 | | | | | | | | | | | |
| CO2 | 2 | | 2 | | 2 | | | | | | | | | | | |
| CO3 | 2 | | 2 | | 2 | | | | | | | | | | | |
| CO4 | 2 | | 2 | | 2 | | | | | | | | | | | |
| CO5 | 2 | | 2 | | 2 | | | | | | | | | | | |
| VI. Assessment Details (CIE & SEE) | | | | | | | | | | | | | | | | |
| General Rules: Refer Annexure section 5 | | | | | | | | | | | | | | | | |
| Continuous Internal Evaluation (CIE): Refer Annexure section 5 | | | | | | | | | | | | | | | | |
| Semester End Examination (SEE): Refer Annexure section 5 | | | | | | | | | | | | | | | | |
| VII. Learning Resources | | | | | | | | | | | | | | | | |
| VII(b) : Reference Books: (Insert or delete rows as per requirement) | | | | | | | | | | | | | | | | |
| Sl. No. | Title of the Book | | | | | Name of the author | | | | | Edition and Year | | Name of the publisher | | | |
| 1 | "Network Security Essentials: Applications and Standards" | | | | | William Stallings | | | | | 6th edition 2016 | | Pearson | | | |
| 2 | "Computer Networking: A Top-Down Approach" by | | | | | James Kurose and Keith Ross | | | | | 6 th edition in 2012 | | Addison-Wesley | | | |
| 3 | "CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide" | | | | | Mike Chapple, James Michael Stewart, and Darril Gibson | | | | | 8th edition 2018 | | Sybex | | | |
| VII(c): Web links and Video Lectures (e-Resources): | | | | | | | | | | | | | | | | |
| https://learn.microsoft.com/en-us/security/ | | | | | | | | | | | | | | | | |
| VIII: Activity Based Learning / Practical Based Learning/Experiential learning: | | | | | | | | | | | | | | | | |
| Seminar, assignments, quiz, case studies, mini projects, industry visit, self-study activities, group discussions, etc | | | | | | | | | | | | | | | | |

| | | | | | |
|--|----------|--------------|----------|--------------|--------|
| Semester: | IV | Course Type: | NCMC | | |
| Course Title: Mindful Mastery: Aptitude and Soft skills Integration | | | | | |
| Course Code: | 23PDSN04 | | Credits: | | PP/NP |
| Teaching Hours/Week (L:T:P:O) | | | 0:0:0:2 | Total Hours: | 24 |
| CIE Marks: | 50 | SEE Marks: | ---- | Total Marks: | 50 |
| SEE Type: | --- | | | Exam Hours: | 00 |
| I. Course Objectives: | | | | | |
| <div>➤ To comprehend numerical relationships, place value, fractions, decimals, percentages, ratios, and proportions.</div> <div>➤ Learn how to prioritize tasks and activities based on importance and urgency..</div> <div>➤ Understanding of different types of data representations, such as tables, charts, graphs, and diagrams.</div> <div>➤ Learn how to interpret different body language signal and their meanings.</div> <div>➤ Learn Strategies for breaking down complex problems into manageable steps</div> | | | | | |
| II. Teaching-Learning Process (General Instructions): | | | | | |
| Chalk and Talk | | | | | |
| Video Demonstration | | | | | |
| Pictorial representation | | | | | |
| PPT presentation and Activity based learning | | | | | |
| III. COURSE CONTENT | | | | | |
| III(a). Theory PART | | | | | |
| Module-1: (Arithmetical Ability) | | | | | 06 Hrs |
| Problems on Pipes Cisterns , Time , Work and Averages | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-2: (Time management and Presentation skills) | | | | | 04 Hrs |
| Misconceptions of Time, Symptoms of Poor Time Management, the ‘Five Time Zone’ Concept, Elements of Effective Time Management. | | | | | |
| ABC of presentation / Accent and pronunciation / Practice to Perform / Impact of voice modulation, eye contact and body language during presentation. Evaluation, Feed back | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-3: (Quantitave section and Data Interpretation) | | | | | 06 Hrs |
| Simple interest and compound interest problems, Bar graphs, Pie charts and Line graphs concepts and problem | | | | | |
| Pre-requisites (Self Learning) | | | | | |
| Module-4: (Body language and Postures) | | | | | 04 Hrs |
| Facial expressions, Gestures, Handshakes, tone of voice, Attitude, Universal vs. Culture specific | | | | | |



CIE & SEE evaluation for Autonomous Scheme 2023 - 24

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

| S. # | Course Type /Credits | Continuous Internal Evaluation (CIE) | | | | | | | | | | | | | | | | | | | Semester End Examination (SEE) | | | | | | | | | | |
|------|--|--------------------------------------|--------------|---------------------|--------------|--------------|--------------|----------------|--------------------------|--------------|----------------|-----------------------|-------------------------|--------------|----------------------|------------------|------------------|--------------|-------------|-----------------|--------------------------------|---------------------|-----------------|----------------------|-----------------------|-------------|----------------------|-----------------|-------------------------|-----------------------|-------------|
| | | Total CIE marks | Min. Eligty. | I. Theory Component | | | | | | | | | II. Practical Component | | | | | | | Total CIE marks | Dur. In hrs. | Theory | | | Practical | | | Total SEE marks | Min. pass % (CIE + SEE) | | |
| | | | | Marks | Min. Eligty. | A. Unit test | | | B. Formative Assessments | | | Tot. Theory marks (I) | Marks | Min. Eligty. | C. Weekly Evaluation | | D. Internal Test | | | | | E. Prj | Tot. marks (II) | Max. conducted marks | Max. considered marks | min. pass % | Max. conducted marks | | | Max. considered marks | min. pass % |
| | | | | | | Nos. | Marks / Each | Tot. | Nos. | Marks / Each | Tot. | | | | Each week | Tot. marks | Nos. | Marks / Each | Total marks | | | | | | | | | | | | |
| 1 | BSC/ESC/PCC/ETC /PEC/OEC (3 or 4 Credit courses) | 50 | 40% | 50 | 40% | 2 | 50 | 50 (avg. of 2) | 2 | 50 | 50 (avg. of 2) | 50 (avg. of A & B) | -- | -- | -- | -- | -- | -- | -- | -- | 50 (I) | 03 | 100 | 50 | 35% | -- | -- | -- | 50 | 40% | |
| 2 | IBSC/IESC/IPCC/ ETC (4 Credit courses) | 50 | 40% | 50 | 40% | 2 | 50 | 50 (avg. of 2) | 2 | 50 | 50 (avg. of 2) | 50 (avg. of A & B) | 50 | 40% | 50 | 50 (Avg. of all) | 1 | 50 | 50 | 50 | 50 (Avg. of C & [D or E]) | 50 (Avg. of I & II) | 03 | 100 | 50 | 35% | -- | -- | -- | 50 | 40% |
| 3 | IESC - CAED (4 credit course) | 50 | 40% | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 | 40% | 50 | 50 (Avg. of all) | 1 | 50 | 50 | -- | 50 (Avg. of C & D) | 50 | 03 | -- | -- | -- | 100 | 50 | 35% | 50 | 40% |
| 4 | PCCL (1 Credit courses) | 50 | 40% | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 | 40% | 50 | 50 (Avg. of all) | 1 | 50 | 50 | 50 | 50 (Avg. of C & [D or E]) | 50 (II) | 03 | -- | -- | -- | 100 | 50 | 35% | 50 | 40% |
| 5 | AEC- IDT, Skill Development courses (1 credit course) | 50 | 40% | 50 | 40% | 1 | 50 | -- | 1 | 50 | 50 (Avg. of 2) | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 (I) | 02 | 50 | 50 | 35% | -- | -- | -- | 50 | 40% | |
| 6 | HSMC- CIP, Env studies, SFH, UHV (1 credit course) | 50 | 40% | 50 | 40% | 1 | 50 | -- | 1 | 50 | 50 (Avg. of 2) | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 (I) | 02 | 50 | 50 | 35% | -- | -- | -- | 50 | 40% | |
| 7 | HSMC - English, Kannada (No credits) | 50 | 40% | 50 | 40% | 1 | 50 | -- | 1 | 50 | 50 (Avg. of 2) | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 (I) | -- | -- | -- | -- | -- | -- | -- | -- | 40% | |
| 8 | NCMC - Personality Development courses, PE, Yoga, NCC, NSS, IKS (No credits) | 50 | 40% | 50 | 40% | -- | -- | -- | 1 | 50 | 50 | -- | -- | -- | -- | -- | -- | -- | -- | -- | 50 (I) | -- | -- | -- | -- | -- | -- | -- | -- | 40% | |

Formative (Successive) Assessments: Assignments/quiz/ seminars/field survey and report presentation/course project/group discussions/etc. based on the faculty & dept. planning. # Practical Conduction: The conduction of each experiment/program per week should evaluate for 50 Marks and average of all shall be taken. # In case of Integrated course, minimum eligibility shall be attained as prescribed in both the theory and practical components.

Self Learning Courses (SLC) Courses, Internship, Mini project & Major Project: Rubrics & Methodology shall be defined seperately

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॥ Jai Sri Gurudev ॥
SRI ADICHUNCHANAGIRI SHIKSHANA TRUST (R)
SJB Institute of Technology

An Autonomous Institution under VTU

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CIE and SEE guidelines for Autonomous Scheme 2023 - 24

Note: Revised as per approvals of 4th Academic Council Meeting held on 05/02/2025

| Continuous Internal Evaluation (CIE) | Semester End Examination (SEE) | Final Passing requirement |
|---|---|---|
| 1. BSC/ESC/PCC/ ETC/PEC/OEC – Theory Course (03 & 04 Credit courses) | | |
| The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. | | |
| <p>Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component (I):</p> <p>I. Theory component: Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA).</p> <p>A. Internal Assessment Test: i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question).</p> | <p>Semester-End Examination: The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks). Duration of 03 hours and total marks of 100.</p> <p>i) The question paper will have ten questions. Each question is set for 20 marks. ii) There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. iii) The students have to answer 5 full questions, selecting one full question from each module. iv) Marks scored shall be proportionally reduced to 50 marks.</p> | <p>The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.</p> |

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| <p>iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcomes defined for the course.</p> <p>B. Formative assessments:</p> <p>i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times.</p> <p>ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week.</p> <p>iii) The syllabus content for the formative assessment shall be defined by the course coordinator.</p> <p>iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc.</p> <p>v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels.</p> <p>vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean.</p> <p>The final CIE marks will be 50: CIE = Avg. {Avg. of two tests + Avg. of two FA} The documents of all the assessments shall be maintained meticulously.</p> | | |
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2. IBSC/IESC/IPCC– Integrated with Theory & Practical (04 credit courses), ETC (if offered as integrated course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation:

The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

Minimum eligibility of 40% marks shall be attained separately in both the theory component and practical component.

CIE will be conducted by the department and it will have 02 component:

- I. Theory Component.
- II. Practical Component.

I. Theory Component:

Theory component will consist of

- A. Internal Assessment Test (IAT).
- B. Formative assessments (FA).

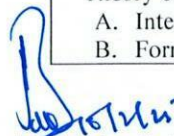
The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

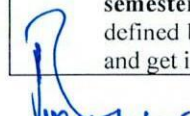
Only theory SEE for duration of 03 hours and total marks of 100.

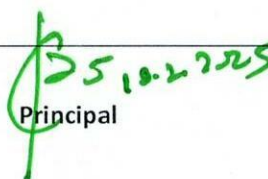
- i) The question paper will have ten questions. Each question is set for 20 marks.
- ii) There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.


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| <p>A. Internal Assessment Test:</p> <ul style="list-style-type: none"> i) There are 02 tests each of 50 marks conducted during 8th week & 15th week, respectively. ii) The question paper will have four questions (max of 3 sub questions) from the notified syllabus. Each question is set for 25 marks. iii) It is suggested to include questions on laboratory content in the Internal Assessment test Question papers. iv) The student must answer 2 full questions (one from 1st & 2nd questions and another from 3rd & 4th question). v) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course. <p>B. Formative assessments:</p> <ul style="list-style-type: none"> i) 02 formative assessments each of 50 marks shall be conducted by the course coordinator based on the dept. planning during random times. ii) One formative assessment shall be completed before 5th week and second shall be completed before 12th week. iii) The syllabus content for the formative assessment shall be defined by the course coordinator. iv) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. v) The assignment QP or Quiz QP shall indicate marks of each question and the relevant COs & RBT levels. vi) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. <p>II. Practical Component:</p> <ul style="list-style-type: none"> C. Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/programs shall be taken. (rubrics will be published by the concerned committee) D. One laboratory Internal Assessment test will be conducted during the 14th week for 50 marks. (rubrics will be published by the concerned committee) E. If the course project / mini project is involved in the laboratory component. The evaluation shall be completed by 14th week of the semester. The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean. | <ul style="list-style-type: none"> iii) The laboratory content must be included in framing the theory question papers. iv) The students have to answer 5 full questions, selecting one full question from each module. v) Marks scored shall be proportionally reduced to 50 marks. <p>No Practical SEE for Integrated Course.</p> <p>Note: CAED Course shall not be considered here. It shall be considered as in sl. No. 3 in the next row</p> | |
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Note:

- i) If component 'E' is involved in the course, either component 'D' or 'E' along with component 'C' shall be considered for average of item II.
- ii) Otherwise, components 'C' & 'D' shall be considered for average of item II.

The final CIE marks will be 50:

CIE= Avg. {I [Avg. of two tests + Avg. of two FA] + II [Avg. of (C & (D or E))]}

The documents of all the assessments shall be maintained meticulously.

Note: CAED Course shall not be considered here, it shall be considered as in sl. no. 3 in the next row.

3. IESC: CAED Course (4 credits)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

- i) CIE shall be conducted for max. marks of 100 and shall be scaled down to 50 marks
- ii) CIE component should comprise of both Manual and computer drafting i.e. 50% manual and 50% computer drafting out of total 100 marks
- iii) CIE component should comprise of Continuous evaluation of drawing work of students as and when the modules are covered based on below detailed weightage.

| Module | Module Max. Marks | Evaluation Weightage in marks | |
|--------------|-------------------|--------------------------------|------------------|
| | | Computer display and print out | Manual Sketching |
| Module 1 | 20 | 10 | 10 |
| Module 2 | 20 | 10 | 10 |
| Module 3 | 20 | 10 | 10 |
| Module 4 | 20 | 10 | 10 |
| Module 5 | 20 | 10 | 10 |
| TOTAL | 100 | 50 | 50 |

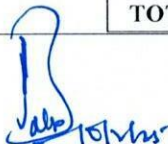
The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

SEE for duration of 03 hours and total marks of 100.

- i) SEE shall be conducted and evaluated for maximum marks of 100 and shall be scaled down to 50 marks.
- ii) Question paper shall be made available for each batch as per schedule.
- iii) Evaluation shall be carried jointly by both the internal & external examiners.
- iv) Scheme of Evaluation: To be defined by both the examiners jointly.
- v) Maximum 3 questions shall be set as per the following pattern.

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.


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- iv) At least one Test covering all the modules is to be conducted for 100 marks during 14th week and the same is to be scaled down to **25 Marks**.
- v) Assignments = **10 Marks from each module. (50 marks scaled down to 25 Marks)**
- vi) The final CIE 50 marks = Test (25 marks) + Assignment (25 marks).

| From Module | | | Marks Allotted |
|--|------------------|--------------------------------|----------------|
| Module 01 (Choice between Lines or Planes) | | | 30 |
| Module 02 (Compulsory question) | | | 40 |
| Module 03 or Module 04 or Module 05 | | | 30 |
| TOTAL | | | 100 |
| Q. No. | Manual Sketching | Computer display and print out | TOTAL MARKS |
| 1 | 15 | 15 | 30 |
| 2 | 20 | 20 | 40 |
| 3 | 15 | 15 | 30 |
| TOT. | 50 | 50 | 100 |

4. PCCL: Laboratory course (01 credit course)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

CIE will be conducted by the department and it will have only 01 component:

- I. Theory Component. (Not required for Laboratory course)
- II. Practical Component.

II. Practical Component:

- C. Conduction of each experiment/program should be evaluated for 50 marks and average of all the experiments/program shall be taken (**rubrics will be published by the concerned committee**).
- D. One laboratory Internal Assessment test will be conducted for 50 marks (**rubrics will be published by the concerned committee**).
- E. If the course project / mini project is involved in the laboratory component. **The evaluation shall be completed by 14th week of the semester.** The rubrics required for the evaluation of the project shall be defined by the departments along with mapping of relevant COs & POs and get it approved from academic dean.

The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).

Semester-End Examination:

Only laboratory SEE will be conducted jointly by the internal examiner and external examiner appointed by COE as per the scheduled timetable for duration of 03 hours.

- i) The examination shall be conducted for 100 marks and shall be reduced to 50 marks proportionately.
- ii) All laboratory experiments/programs are to be included for practical examination.
- iii) Breakup of marks (Rubrics) and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners (OR) based on the course

The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.


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| <p>Note:</p> <p>i) If component 'E' is involved in the course either component 'D' or 'E' along with component 'C' shall be considered for average of item II.</p> <p>ii) Otherwise, components 'C' & 'D' shall be considered for average of item II.</p> <p>The final CIE marks will be 50 = Avg. of (C & [D or E])</p> <p>The documents of all the assessments shall be maintained meticulously.</p> | <p>requirement evaluation rubrics shall be decided jointly by examiners.</p> <p>iv) Students can pick one question (experiment/program) from the questions lot prepared by the internal /external examiners jointly.</p> <p>v) Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.</p> <p>vi) General rubrics suggested for SEE: writeup-20%, Conduction procedure and results-60%, Viva-voce 20% of maximum marks.</p> <p>vii) Change of experiment is allowed only once and shall be assessed only for 85% of the maximum marks.</p> | |
| <p>5. AEC: Ability Enhancement Courses (01 credit courses)</p> | | |
| <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.</p> | | |
| <p>The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).</p> <p>Continuous Internal Evaluation: CIE will be conducted by the department and will have only 01 component:</p> <p>I. Theory component. Theory Component will consist of</p> <p>A. Internal Assessment Test (IAT). B. Formative Assessments (FA).</p> <p>A. Internal Assessment Test:</p> <p>i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.</p> | <p>The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).</p> <p>Semester-End Examination: Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50.</p> <p>i) Multiple choice Question paper. ii) The students have to answer all questions.</p> | <p>The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.</p> |

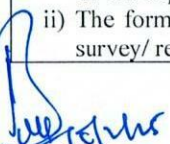
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| <p>B. Formative assessments:</p> <ul style="list-style-type: none"> i) 01 formative assessment of 50 marks shall be conducted by the Course coordinator based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. <p>The final CIE marks will be 50: CIE = Avg. of 02 events (01 IAT and 01 FA). The documents of all the assessments shall be maintained meticulously.</p> | | |
| <p>6. HSMC: (01 credit course)</p> | | |
| <p>The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%.</p> | | |
| <p>Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and will have only 01 component:</p> <p>I. Theory component. Theory Component will consist of A. Internal Assessment Test (IAT). B. Formative Assessments (FA).</p> <p>A. Internal Assessment Test:</p> <ul style="list-style-type: none"> i) 01 test of 50 marks conducted during 15th week. ii) The question paper will be of Multiple-Choice Questions (MCQ). iii) The student must answer all questions. iv) IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course <p>B. Formative assessments:</p> <ul style="list-style-type: none"> i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. ii) The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. | <p>The minimum passing mark for SEE is 35% of the maximum marks (18 out of 50 marks).</p> <p>Semester-End Examination: Theory SEE will be conducted by COE as per the scheduled timetable for duration of 02 hours and total marks of 50.</p> <ul style="list-style-type: none"> i) Multiple choice Question paper. ii) The students have to answer all questions | <p>The student is declared as a pass in the course if he/she secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE and SEE taken together.</p> |


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| <p>iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels.</p> <p>iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs.</p> <p>The final CIE marks will be 50: CIE = Avg. of 02 events (01 IAT and 01 FA).</p> <p>The documents of all the assessments shall be maintained meticulously.</p> | | |
| 7. HSMC: (0 credit courses) | | |
| The weightage is only for Continuous Internal Evaluation (CIE). | | |
| <p>Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). CIE will be conducted by the department and it will have only 01 component:</p> <p>I. Theory component. Theory Component will consist of</p> <ol style="list-style-type: none"> Internal Assessment Test (IAT). Formative assessments (FA). <p>A. Internal Assessment Test:</p> <ol style="list-style-type: none"> 01 test of 50 marks conducted during 15th week. The QP will be of Multiple-Choice Questions (MCQ). The student must answer all questions. IAT QP shall be designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course <p>B. Formative assessments:</p> <ol style="list-style-type: none"> 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during 12th week. The formative assessments include Assignments/seminars/case study/field survey/ report presentation/course project/etc. The assignment QP shall indicate marks of each question and the relevant COs & RBT levels. The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs. <p>The final CIE marks will be 50: CIE = Avg. of 02 events (01 IAT and 01 FA).</p> <p>The documents of all the assessments shall be maintained meticulously.</p> | <p>No Semester End Examination.</p> | <p>The student is declared as a pass in the course if he/she secures a minimum of 40% (20 marks out of 50) in the CIE.</p> |

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8. NCMC: (0 credit course)

The weightage is only for Continuous Internal Evaluation (CIE).

Continuous Internal Evaluation: The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).

CIE will be conducted by the department and it will have only 01 component:

I. Theory component.

Theory Component will consist of only 01 assessment

- A. Internal Assessment Test (not required for NCMC course).
- B. Formative Assessment (FA).

B. Formative assessments:

- i) 01 formative assessment of 50 marks shall be conducted by the faculty based on the dept. planning during random times during 12th week.
- ii) The formative assessments include Quiz/Assignments/seminars/case study/field survey/ report presentation/course project/etc.
- iii) The assignment QP shall indicate marks of each question and the relevant COs & RBT levels.
- iv) The rubrics required for the other type of formal assessments shall be defined by the departments along with mapping of relevant COs & POs.

The final CIE marks will be 50.

The documents of all the assessments shall be maintained meticulously.

No Semester End Examination.

The student is declared as a pass in the course if he/she secures a minimum of 40% (20 marks out of 50) in the CIE.

Academic Dean
Dr. Babu N V

Academic Dean

Academic Director
Dr. Puttaraju

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Dr. K V Mahendra Prashanth

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Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi
Accredited by NAAC with 'A+' grade, Certified by ISO 9001 - 2015
Recognized by UGC, New Delhi with 2(f) & 12 (B)



Program Outcomes (POs)- Graduate Attributes

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change



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ARIIA

ATAL Ranking:
Band Performer



Band of 151 to 300 in
Innovation Category