



Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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XXXI Academic Council (AC) Minutes- Annexure-2.5

Dt: 10-12-2020

Department of Electrical & Electronics Engineering Minutes of the XXV BOS Meeting

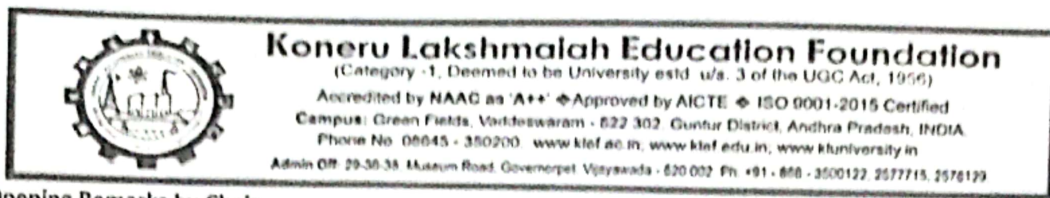
The Department XXV BOS meeting will be held on 10th December 2020 from 1.30 PM onwards in online mode

The following members were present:

1. Dr. J Somlal-Professor & HoD, Department of EEE, KLEF- Chairman
2. Dr K Siva Kumar, Associate Professor, IIT Hyderabad-External Member
3. Dr. Suresh Kumar Gadi, Professor, Universidad Autonoma de Coahuila-External Member
4. Dr. Praveen Damacharla, Research Scientist & Co-Founder, KineticAI.com-External Member
5. Dr. Dogga Raveendra, CTO & Director, Zunik Energies Pvt. Ltd- External Member
6. Dr M V V K Srinivasa Prasad, Assistant Professor & Associate Dean Curriculum Aspects TLP KLEF- Invited Member from DAO
7. Dr M Venkata Narayana, Professor, ECE Department, KLEF-Co-Opted Member
8. Dr. J V Shanmukha Kumar, Professor, Department of Chemistry, KLEF-Co-Opted Member
9. Dr K V Divya, Professor, Department of English, KLEF- Co-Opted Member
10. Dr N S M P Latha Devi, Associate Professor, Department of Physics, KLEF- Co-Opted Member
11. Mr. T Ratna Prasad, Assistant Professor, ME Department, KLEF-Co-Opted Member
12. Dr K Subba Rao Professor, Department of EEE, KLEF- Internal Member
13. Dr S V N L Lalitha, Professor, Department of EEE, KLEF- Internal Member
14. Dr K Narasimha Raju, Professor, Department of EEE, KLEF- Internal Member
15. Dr A Pandian, Professor, Department of EEE, KLEF- Internal Member
16. Dr B Loveswara Rao, Professor, Department of EEE, KLEF- Internal Member
17. Dr P Srinivas Varma, Associate Professor, Department of EEE, KLEF- Internal Member
18. Dr M Kiran Kumar, Associate Professor, Department of EEE, KLEF- Internal Member
19. Dr B Jyothi, Associate Professor, Department of EEE, KLEF- Internal Member
20. Mrs. K Sarada, Associate Professor, Department of EEE, KLEF- Internal Member
21. Mr R Bhanu Prakash, Associate Professor, Department of EEE, KLEF- Internal Member
22. Mr. D Seshi Reddy, Associate Professor, Department of EEE, KLEF- Internal Member
23. Dr G G Raja Sekhar, Associate Professor, Department of EEE, KLEF-Internal Member
24. M. M Naga Chaitanya, Assistant Professor, Department of EEE, KLEF-Internal Member

Members Absent: NIL

J. Somlal
2020
Dr. JARURULA SOMLAL
Professor & HOD
Department of EEE
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Green Fields, Vaddeswaram,
Guntur Dt., A.P.-522 302.



Opening Remarks by Chair

1. Dr. J Somlal, Chairman BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members of the board. He thanked them for accepting to become members of the Board of Studies.
2. The Chairman reported the faculty awards and recognitions, research activities and placement status of the department for the last academic year before the BoS members.
3. The Chairman of BoS informed the members present, about the Department Academic Committee (DAC) meeting held on 03/12/2020 and highlighted the major resolutions of discussion as brought to the notice of the DAC by the student members. He then put forward the agenda items before the board for recommendations to the Academic Council (Annexure I: DAC MoM dt.).

AGENDA and RESOLUTIONS

AGENDA ITEM-1

Course Structure proposed and new course introduction for A.Y:2020-21 admitted B.Tech Programs.	It is resolved to approve the curriculum of the 2020-2021 admitted batch and the same is recommended to the academic council for approval
---	---

As per the feedback from academic peers, industry experts and alumni to improve practical knowledge and skills among the students few changes in the B.Tech structure were put before the BoS members for review.

SL	Course Code	Course Title	Course Type	Remarks
1	20EE3211	Industrial Drives and Control	Elective	New course (Industrial Automation)
2	20EE3211	Industrial Communication Protocols and Cyber Security	Elective	New course (Industrial Automation)
3	20EE3206	Smart Sensors And Sensor Networking	Elective	New Course (Industrial Automation)
4	20EE3205	Electric vehicle technology	Flexi core	New Course added in list of flexi core
5	20EE3201	Custom Powered Devices	Flexi core	New Course added in list of flexi core
6	20EE3104	Green Energy Fundamentals	Flexi core	New Course added in list of flexi core
7	20EE3207	Switched Mode Power Supplies	Flexi core	New Course added in list of flexi core
8	20EE2104	Mathematical Transforms for Signal Processing	Basic Science	New Course (Based on the academic peers' feedback to incorporate transformations required for EEE core subjects such as power system analysis, control systems and power electronics, a new course with theory and tutorial components covering S- S-domain and Z-domain transformations is introduced)

As per the contemporary requirements Dr. Praveen Damacharla, Research Scientist & Co-Founder, KineticAI.com, industry expert to introduce a new specialization Industrial Automation

- Dr Praveen Damacharla, Research Scientist and co-founder, of Kinetic AI.com has suggested including **Industrial Drives And Control, Industrial Communication Protocols And Cyber Security and Smart**

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Sensors And Sensor Networking for Industrial Automation specialization syllabus has been modified and approved by the BOS members.

- Satyardha Pravarshik (Id No:1700060030) requested a skill component in **Data Structure and algorithms** for the immense knowledge of students.
- Dr. K. Siva Kumar, Associate Professor, IIT Hyderabad. has suggested including **Electric vehicle Technology** as a flexicore.
- Dr P Srinivas Varma, Associate Professor-EEE, KLEF recommended including **Custom Powered Devices, Green Energy Fundamentals, and Utilization of Electrical Energy** courses.
- As per contemporary requirements and academic peers' feedback **Mathematical Transforms for Signal Processing** is recommended to include transformation concepts required in core courses.

The finalized course structure for 2020-21 B.Tech-EEE is provided in Point 1 of Annexure III

The syllabus of new Courses is shown in point 3 of Annexure III

AGENDA ITEM-2

Proposed to revise the Syllabus for the Y20 batch courses based on the feedback received from stakeholders	It is resolved to approve the course revisions of A.Y: 2020-2021 and the same is recommended for the academic council for approval
--	--

The following course revision in the syllabus is done

SL	Course Code	Course Title	Course Type	Percentage of Revision	Remarks
1	20EE1201	Basic Electrical and Electronic Circuits	ES	20%	A lab component is included in the course as per the feedback from alumni
2	20EE2101	Electrical Circuits	ES	15%	As per the academic peers' recommendation not to reduce the practical component contact hours, to accommodate for credits provided the skilling component is introduced.
3	20SC1203	OBJECT-ORIENTED PROGRAMMING	ES	15%	A lab component is included in the course as per the feedback from the faculty

- Mr.D Seshi Reddy, Associate Professor-EEE, KLEF suggested that the practical component in the **Electrical circuits** course be modified to a skill component.
- Mr D Kalyan, Assistant Professor-EEE, KLEF suggested the need for a practical component for the **BE** course to be reviewed
- Mr. R B R Bhanu Prakash, Associate Professor-EEE, KLEF recommended more contact hours for practical components in **Object Oriented Programming** because of placements.

The revisions proposed in the syllabus of 20EE1201- **Basics of Electrical and Electronics Engineering** are approved by BOS members (Point 2 of Annexure III)

The syllabus changes are shown in (Point 1 of Annexure-IV)

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AGENDA ITEM-3

Course Structure proposed for 2020-21 admitted M.Tech-PS AND M.Tech -PED Programs.

It is resolved to approve the curriculum of the M.Tech PS and PED programs 2020-2021 admitted batch and the same is recommended for the academic council for approval

As per the feedback from academic peers, industry experts and alumni to improve practical knowledge and skills among the students few changes in M.Tech structures were put before the BoS members for review. The structure and syllabus revision for 2020-21 M.Tech-PED and 2020-21 M.Tech-PS are approved by the BoS members

(Point 1 and point 2 of Annexure-IV)

AGENDA ITEM-4

Value-added courses to be offered in AY 2020-21 for the B.Tech EEE program

BOS members recommended for academic council approval

The syllabus of value-added courses is reviewed for mapping to employability entrepreneurship or career progress. The courses are planned to be delivered by APSSDC, Decibel Labs Pvt. Ltd. The reputation of the course-delivering organizations and the usefulness of the certificate were discussed and courses are approved by the BoS members.

(Point 1 of Annexure-V)

AGENDA ITEM-5

Approval of Program Development Document for 2020-21 admitted B.Tech and M.Tech Programs

BOS members recommended for academic council approval

The program development document for 2020-21 B.Tech and M.Tech structures highlighting Local/Regional/National/ Global needs and Mapping to courses is presented to all the BoS members and is reviewed for significance to the introduction or revision of courses.

(Annexure-VI, Annexure-VII, Annexure-VIII)

AGENDA ITEM-6

Review of the Percentage of courses mapped to employability, entrepreneurship and skill development for 2020-21 B.Tech-EEE, M.Tech-PED and M.Tech-PS programs

BOS members recommended for academic council approval

The finalized courses were reviewed by BoS members for mapping to employability, entrepreneurship, and skill development. The weightage of courses mapping for each component is analyzed (point 1 of Annexure-III, point 1 of Annexure-IV)

AGENDA ITEM-7

Proposal for Introduction of New UG and PG programs

BOS members recommended going for a survey before introducing new programs

In addition to the existing UG program B.Tech-EEE, a new UG program B.Tech-Electrical & Computer Engineering with 60 in-take is proposed.

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14/12/2020
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Dr K Siva Kumar as suggested that, this would have a broader perspective and putting together ECE, EEE, and CSE may make it a bigger department.

Dr Gadi has suggested that this will not have an effect on the students opting for higher education abroad and also would open a greater chance for placements.

Suggestions and proposals for introducing a new PG Program in Electric Vehicle and Autonomous Vehicle technologies are put forward by the BoS Chairman.

Dr. K Siva Kumar has suggested that the program title should be "Electric Vehicles and Artificial Intelligence", which would have more scope. Dr. Suresh Kumar Gadi suggested to have a good lab set up for the proposed program.

AGENDA ITEM-8

Review of Results obtained last semester and CO-PO attainment

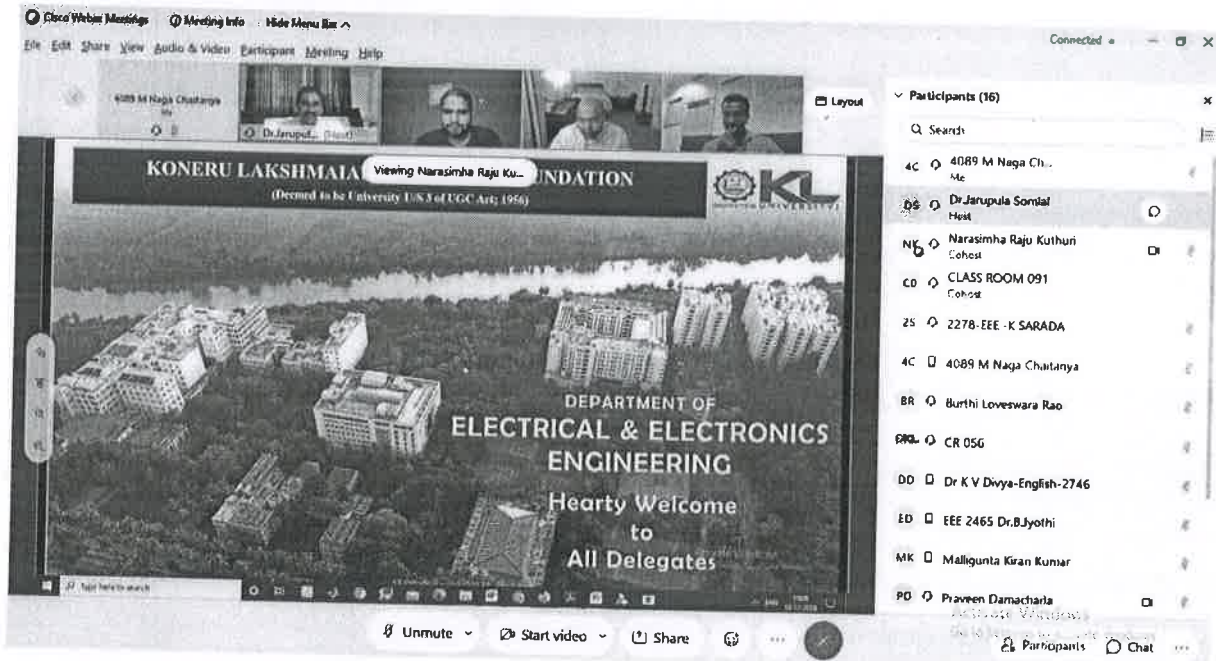
It is resolved to approve CO-PO attainment of the previous semester and the same is recommended to the Academic Council

AGENDA ITEM-9

ANY other items

Bos members appreciated the unlversity for conducting smooth way of online courses and end-sem exams

Pictures of BOS meeting proceedings:



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14/12/2020

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File Edit Share View Audio & Video Participant Meeting Help

4089 M Naga Chaitanya CLASS ROOM 091 Dr.Jarupula Somlal Harasimha Raju Kulkarni Seshi Reddy Daka Layout

Participants (20)

- AC 4089 M Naga Chaitanya
- BR Burthi Loveswara Rao
- CR CR 056
- DL Dr.SV.NL Lalitha
- ED EEE 2465 Dr.B.Jyothi
- MK Malligunta Kran Kumar
- PD Praveen Damacharla
- RR R B R PRAKASH
- RP Ratna Prasad Paladugu
- SD Seshi Reddy Daka
- SK siva kumar
- SG Suresh Kumar Gadi

Viewing Dr.Jarupula Somlal

02:10 PM - 02:30 PM

02:30 PM - 02:50 PM

Unmute Start video Share

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Viewing Dr.Jarupula Somlal

Speaking: siva kumar, Dr.Jarupula Somlal

siva kumar

Participants (21)

- 2S 2270-EEE - K SARADA
- AC 4089 M Naga Chaitanya
- BR Burthi Loveswara Rao
- CR CR 056
- DL Dr.NSMPLatha Devi
- DL Dr.SV.NL Lalitha

Basics of Electrical and Electronics Engineering
(Offered to IIV II Tech EEE, II semester)

Course Code: 202-21120
Pre Requisite: Nil
L-T-P-S: 3-1-2-0
Credits: 5

CO1: Mesh and Nodal Analysis, Theorems: Introduction to network elements, Mesh and Nodal Analysis, Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer, star-delta transformation and source transformation. - Simple numerical problems.

CO2: Fundamentals of AC, Resonance, RMS and average values and form factor of Sinusoidal wave form, steady state analysis of R, L and C (in series, parallel and series parallel combination) with sinusoidal excitation, concept of reactance, impedance, admittance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, resonance, complex and polar forms of representations, complex power, Series and parallel, resonance, bandwidth, selectivity, Q factor, current locus diagrams.]

CO3: Basic active Circuits elements: P-N junction semiconductor, P-N junction, forward bias and reverse bias, V-I characteristics, ideal and practical diodes, approximate model, diode data sheet, types of diodes and various (introduction level only), Types of transistors (PNP and NPN)

CO4: Applications of active elements: Clippers, Clampers, Rectifiers - HWB, FWR with and without capacitive filter, Power supply with ripple reduction and regulation, Zener diode as a voltage regulator, Applications of Transistors: Transistor as an amplifier, switching transistor, power transistor (low, medium and large power), key parameter from data sheet. Analog & Digital ICs: 7405, 7405, K-741, IC-555, LM-339, LM723.

Text Books:

1. John Bird, Electrical Circuit Theory and Technology, Knowledge publishers, 6th edition, 2017
2. Electronics Devices and Circuit Theory 12th Edition - Robert L. Boylestad

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14/12/2020
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The screenshot shows a Cisco Webex meeting interface. The main window displays a slide titled "Viewing Dr.Jarupula Somlal...". The slide content includes:

- 4. Aims to understand cloud services for IoT applications and implement IoT automation logic and cloud services using Raspberry pi Board.
- Syllabus:**
 - Internet of Things -Definition, Scope, Factors for IoT Application, Structure of IoT, IoT Map, Device Hardware requirements for IoT - Description, Classification & Characteristics of Services and standards, IOT devices for automation, Embedded boards for IoT, simulation of Components performance using Tera CAD online platform, mini project.
 - Python (snippets review on data types, Data Structures, Classes, visualization tools
 - Raspberry pi J Overview - Raspberry pi J Selection - pin specifications - Analogue and digital I/O Devices & Motor Controls - TX-RX, PWM, INT, I2C Concepts
 - Working with Raspberry Pi Model - Installing OS and Designing Systems using Raspberry pi - Configuring Raspberry Pi for VNC Connection - Getting introduced to Linux OS Basic Linux commands and uses - Getting started with Python to Interface sensor and Actuators with Raspberry Pi
 - Raspberry Pi Programming and Interfacing- Basic Functions- Math, Timing, Interrupts, Libraries, Terminal, Head-Write Analogue and digital inputs, motor control, Relay Operation, Various Sensor interfacing for data visualization and process.
 - Cloud Computing / Basic cloud systems, parallel processing in the cloud, distributed storage systems, cloud computing protocols used, Role of Web services, Deployment Models- Public Clouds, Community Clouds, Hybrid Cloud, Private Cloud, Database Services -Regional DDMs, BDI- Services, Applications and Case study Hardware Implementation.

The chat window on the right shows a message from Dr.S.V.N.L Lalitha: "please check slides in 2-1-7 is missing. Example Syllabus: Introduction to computer aided design, classification of CAD operations, modified nodal admittance matrix, frequency domain analysis, time-domain analysis of nonlinear circuits, sensitivity analysis, high-frequency modeling and design." The chat also shows a "Thank you. Suggestions are well taken sir" message.

J- Omkar
24/12/2020
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Annexure-I

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Stake Holders Feedback Summary for A.Y 2020-21

Feedback from different stakeholders has been collected on the curriculum offered for the academic year 2021-22

Serial Number	Type of Stakeholder	Number of feedbacks
1	Students	65
2	Parents	10
3	Alumni	10
4	Faculty	17
5	Academic peers	10
6	Industry persons	10
Total		122

Serial Number	Recommendations	Action taken in BoS
Students Feedback		
1	Tholapu Keerthi Job-oriented skills have to be taught as a part of specializations	Bos members recommend to academic council's approval
2	Chennupati Prathyusha suggested having OOPS and Data structure in different semesters	It is resolved to plan differently in various semesters
Faculty Feedback		
3	M Naga Chaitanya recommended having an Industrial Automation specialization for B.Tech Specialization Students	Bos members agreed to offer new specialization and the same was forwarded to the academic council.
4	Dr. J Somlal-HOD EEE Suggested to offer pre-requisite courses for the inter-department specializations offered by other departments	Pre-requisites were included for a few courses.
5	Mr. R B R Bhanu Prakash, Faculty, KLEF recommended more contact hours for practical components in Object Oriented Programming given placements.	Bos members agreed to offer more contact hours for practical components in Object-oriented Programming and the same was forwarded to the academic council.
Academic peers and		
6	For the 2018 curriculum, the syllabus of the Analog Electronic Circuits Design (AECD) Course is to be modified.	AECD course syllabus was modified as 3-0-2-0-3 Structure
7	Dr. V. Sonti-NIT Delhi-Advanced topics in electrical circuits to be taken up in semester -3 with skill development.	These suggestions were not possible to incorporate into the 2019-20 curriculum. But will be considered for the 2020-21 curriculum.

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8	Dr. V. Sonti-NIT Delhi-Circuit concepts which are prerequisites for Semester 3, have to be taught in Semester 2.	Topics were included in the BE
9	Change in the BTL level in BE courses to apply level.	Analyzed and identified the need for improvement and changed the BTL level.
Industry Person Feedback		
10	V Raja Phani deep suggested in Lab or skilling for AI & IoT courses in specialization subjects provides a better understanding of the course and helps to achieve course outcomes	Identified suitable subjects and drafted structure, tentative experiments to recommend for BoS
11	Project learning should be a blend of a software tool applied to core course concepts	Planned to include Python programming-based simulation applied to core courses in semester 3 and semester 4 and the same is recommended for discussion in BoS
12	Dr Praveen Damacharla has suggested including Industrial Drives And Control, Industrial Communication Protocols and Cyber Security and Smart Sensors And Sensor Networking for the Industrial Automation specialization	Considered, and analyzed the syllabus for the Industrial Automation specialization.
13	Mid-grad capstone project should come from the outcomes of lab components in core courses for semester 5 and from specialization courses for semester 6	A tentative list of projects/project statements is recommended for discussion in BoS
Parents Feedback		
14	Muppala Hari Srinivasa Prasad, Suggested offering certificate courses on current technologies, that will help them for placement.	Bos members agreed to certifications.
15	M.Amarnadh recommended focusing on more practical knowledge	Faculty are instructed to focus more on the Laboratory for the benefit of students
Alumni Feedback		
16	CH S BALASUBRAHMANYAM , NIT Jamshedpur Indi. Recommended that interested Students can get Practical Exposure to Core Technologies	BOS members recommend to academic council's approval
17	K S Prajwal, Asst Executive Engineer, APGENCO, India- I recommended teaching the students of EEE the core subjects more rather than concentrating on how to place the student in a software company, it's easy to get a good job in the core company if he/she is very sound in core knowledge	Bos members strongly recommended training students as per their interest

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Annexure-II

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT ACADEMIC COMMITTEE (DAC) MEETING MINUTES

The Department of Electrical and Electronics Engineering, K L Deemed to be University, has scheduled a Department Academic Committee (DAC) meeting on 03/12/2020 at 1:30 PM in the Head of the Department chambers.

Members of the Department Academic Committee:

S.No	Name of the member	Designation	Member
1	Dr. J Somlal	Professor & HOD	BOS Chairman
2	Dr. K Narasimha Raju	Professor, Department of EEE	BOS Secretary
3	Dr S V N L Lalitha	Professor, Department of EEE	Internal Member
4	Dr. P S Varma	Associate Professor, RPAC Chairman, Department of EEE	Internal Members
5	Dr. A Pandian	Professor & PED Research Group Head, Department of EEE	Internal Member
6	Dr. B Loveswara Rao	Professor, Power Systems Research Group Head, Department of EEE	Internal Member
7	Dr. M Kiran Kumar	Associate Professor, Department of EEE	Internal Member
8	Dr. B Jyothi	Associate Professor, Department of EEE	Internal Member
9	Mrs. K Sarada	Associate Professor, Department of EEE	Internal Member
10	Mr. R B R Prakash	Associate Professor, Department of EEE	Internal Member
11	Mr. D Seshi Reddy	Associate Professor, Department of EEE	Internal Member
12	Mr. G G Raja Sekhar	Associate Professor, Department of EEE	Internal Member
13	Mr. M Naga Chaitanya	Assistant Professor, Department of EEE	Internal Member
14	Mr. S RajaSekhar	Assistant Professor, Department of EEE	Internal Member
15	Mrs. D. Sudha	Assistant Professor, Department of EEE	Internal Member

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Reporting Items:

- Faculty awards and recognitions
- Research activities in the department
- Placement status

Agenda Points:

- Proposed changes in academic course structure of 20-21 admitted students.
- Discussion on Stake holder's feedback for the courses to be offered in A.Y. 2020-21 even semester.
- Discussion on the inclusion of laboratory components and change of L-T-P-S structure for 18EE3201-Electrical Engineering Measurements course for Y18 curriculum.
- To finalize the certificate course to be offered for Y17, Y18 and Y19 admitted batches for A.Y. 2020-21 even semester.
- Discussions on industry connect & and certificate courses to be offered under the specializations in the department.

Minutes of the Meeting:

- HOD has presented the faculty awards, various research activities conducted during the odd semester of A.Y. 2020-21 and the current placement status.
- All DAC members approved the course 20SC1202 Data Structure and Algorithms with L-T-P-S structure of 3-0-2-4, forwarded to BOS for approval (as mentioned in Annexure I).
- Also, the members approved to offer of the course 20SC1203 Object Oriented Programming with L-T-P-S structure of 2-0-4-0 in II Year Odd semester.
- Stake holder's feedback is discussed at length and the BOS chair suggested implementing new teaching pedagogies for effective course delivery.
- The list of courses for which the modifications are proposed by the course coordinators (as mentioned in Annexure II) for the even semester 20-21 are forwarded to BOS for approval.
- All the DAC members approved the proposed revisions in the L-T-P-S structure of 18EE3201-Electrical Engineering Measurements and forwarded them to BOS for approval.
- All DAC members approved the syllabus of skilling courses (as mentioned in Annexure III) to be offered in the even semester for the A.Y. 2020-21 and forwarded to BOS for approval.
- All the DAC members approved the certificate courses (as mentioned in Annexure IV) to be offered for Y17, Y18 and Y19 and forwarded to BOS for approval.

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9. HOD called the research group heads to have a MoU with industries related to specializations and also to have global certifications.

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14/12/2020

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Annexure-III

Course structure and Syllabus Revision for the 2020-21 B.Tech EEE program

1. Course structure for 2020-21 admitted BTech-EEE program

SL	Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New Course/Revised Course/Retained Course	Changes Proposed by	Justification
1	20UC1101	Integrated Professional English	HSS	0	0	4	0	2	Nil	Retained		Employability Covers the soft, verbal and Quantitative reasoning skills Concepts which help the students attain better employment
2	20UC1202	English Proficiency	HSS	0	0	4	0	2	Nil	Retained		Employability Covers the soft, verbal and Quantitative reasoning skills Concepts which help the students attain better employment
3	20UC2103	Professional Communication Skills	HSS	0	0	4	0	2	Nil	Retained		Employability Covers the soft, verbal and reasoning skills Concepts which helps the students attain better employment
4	20UC2204	Corporate Communication Skills	HSS	0	0	4	0	2	Nil	Retained		Employability Covers the soft, verbal and reasoning skills Concepts which helps the students attain better employment
5	20UC3005	Aptitude Builder	HSS	0	0	4	0	2	Nil	Retained		Employability Covers the soft, verbal and reasoning skills Concepts which helps the students attain better employment
6	20UC0007	Indian Heritage and Culture	HSS	2	0	0	0	0	Nil	Retained		Employability Covers the soft, verbal and reasoning skills Concepts which helps the students attain better employment


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7	20UC0008	Indian Constitution	HSS	2	0	0	0	0	0	Nil	Retained	Employability	Contemporary knowledge as required for entrance tests of PSU Graduate engineer trainees
8	20UC0009	Ecology & Environment	HSS	2	0	0	0	0	0	Nil	Retained	Employability	Contemporary knowledge as required for entrance tests of PSU Graduate engineer trainees
9	20UC0010	Universal Human Values & Professional Ethics	HSS	2	0	0	0	0	0	Nil	Retained	Employability	Contemporary knowledge as required for entrance tests of PSU Graduate engineer trainees
10	20UC0011	Entrepreneurship	HSS	2	0	0	0	0	0	Nil	Retained	Entrepreneurship	Covers essentials of entrepreneurship thinking
11	20MT1101	Mathematics for Computing	BS	2	2	0	2	4.5	Nil	Retained	Entrepreneurship	Entrepreneurship	Covers essentials of entrepreneurship thinking
12	20EE2104	Mathematical Transforms for Signal Processing	BS	2	1	0	0	3	Nil	New	Academic Peers	Skill Development	Covers the applications of mathematics for computation in domain courses
13	19MT2102	Mathematics for Engineers	BS	2	1	0	0	3	Nil	Retained	Skill Development	Skill Development	Covers the applications of mathematics for circuit branches which helps the students attain better employment
14	20UC1102	Design Thinking and Innovation-I	BS	1	0	0	4	2	Nil	Retained	Entrepreneurship	Entrepreneurship	Enhances entrepreneurial thinking

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15	20UC1203	Design Thinking and Innovation II	BS	1	0	0	4	2	Nil	Retained		Entrepreneurship	Enhances entrepreneurial thinking
16	19BT1001	Biology for Engineers	BS	2	0	0	0	2	Nil	Retained		Employability	Covers the applications of mathematics in EEE core courses which helps the students for attaining better employment
17	19PH1006	Materials & Measurements (Science Elective-1)	BS	3	0	2	0	4	Nil	Retained		Employability	Covers the knowledge required for materials and measurements necessary for electrical engineering
18	19CY1101	Engineering Chemistry (Science Elective-2)	BS	3	0	2	0	4	Nil	Retained		Employability	Covers the applications of chemistry which helps students attain better employment
19	20EE2101	Electrical Circuits	ES	2	0	0	2	2.5	20EE1201	Revised	Academic Peers	Employability	Covers the important circuit laws, theorems, and methods necessary for electrical engineers
20	20SC1101	Computational Thinking for Design	ES	3	0	2	6	5.5	Nil	Retained		Skill Development	Covers significant topics of computing knowledge for all engineers
21	20ME1103	Design Tools Workshop - I	ES	0	0	4	0	2	Nil	Retained		Skill Development	Covers the design tools workshop Concepts which helps the students attain better employment
22	20SC1202	Data Structures and Algorithms	ES	3	0	2	4	5	Nil	Retained		Employability	Covers the design tools and data structures required for advanced electrical applications

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23	20SC1203	Object Oriented Programming	ES	2	0	4	0	4	Nil	Retained	Employability	Covers the programming Concepts which help students attain better employment	
24	19SC1209	Design Tools Workshop - II	ES	0	0	4	0	2	Nil	Retained	Employability	Covers the design tools workshop Concepts which helps the students attain better employment	
25	20EC1101	Digital Logic & Processors	ES	3	0	2	0	4	Nil	Retained	Employability	Covers the basic digital electronics concepts essential for the application of processors and controllers	
26	19EC1202	Computer Organization & Architecture	PC	2	0	0	0	2	Nil	Retained	Employability	Covers the hardware aspects of computer architecture which helps for employment in the semiconductor industry	
27	20EE1201	Basic Electrical and Electronic Circuits	ES	3	1	2	0	5	Nil	Revised	Academic Peers	Employability	Basic knowledge of electrical and electronic devices is very much an essential prerequisite for electrical core subjects
28	19EE2205	Sensors & Instrumentation	ES	3	0	0	0	3	Nil	Retained	Employability	Covers the industry-needed basic sensing and data acquisition concepts	
29	19EC2103	Analog Electronics Circuit Design	PC	3	0	2	2	4.5	Nil	Retained	Employability	Covers the essential electronic circuits needed for building electrical & and electronics engineering applications	
30	19EC2106	Embedded Controllers	PC	2	0	3	2	4	Nil	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies	

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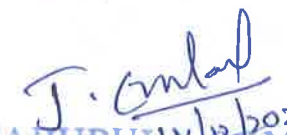
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31	19EE2102	Electrical Power Engineering	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies
32	19EE2103	Electrical Machines	PC	3	0	2	0	4	Nil	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies
33	19EE2201	Industrial Applications of Electrical Machines	PC	3	0	2	0	4	19EE2103	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies
34	19EE2202	Power Electronics	PC	3	0	2	2	4.5	20EE1201	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies
35	19EE2203	Computer Applications in Power Systems	PC	3	0	2	0	4	19EE2102	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies
36	19EE2204	Control Systems	PC	3	0	2	2	4.5	Nil	Retained	Employability	Covers the core engineering Concepts which help the students attain better employment in EEE core companies
37	19EE3121	SOLAR AND MICRO ENERGY TECHNOLOGIES	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in renewable energy technologies which helps the students attain better employment


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38	19EE3122	WIND AND ENERGY STORAGE TECHNOLOGIES	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in renewable energy technologies which helps the students attain better employment
39	19EE3123	ENERGY MANAGEMENT AND GREEN BUILDINGS	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in renewable energy technologies which helps the students attain better employment
40	20EE3221	AI AND IOT FOR GREEN ENERGY INTEGRATION	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in renewable energy technologies which helps the students attain better employment
41	20EE3222	GRID INTEGRATION OF RENEWABLE ENERGY SOURCES	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in renewable energy technologies which helps the students attain better employment
42	19EE3141	POWER TRAIN DESIGN FOR ELECTRIC VEHICLE	PE	3	0	0	0	3	19EE2103	Retained	Employability	Covers the advanced Concepts in electric vehicle technologies which helps the students attain better employment
43	19EE3142	BATTERY STATE ESTIMATION ALGORITHMS FOR ELECTRIC VEHICLE	PE	3	0	0	0	3	NIL	Revised	Employability	Covers the advanced Concepts in electric vehicle technologies which helps the students attain better employment
44	19EE3143	CHARGING STATIONS FOR ELECTRIC VEHICLES	PE	3	0	0	0	3	19EE2202	Retained	Employability	Covers the advanced Concepts in electric vehicle technologies which helps the students attain better employment

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45	20EE3241	AI AND IOT FOR ELECTRIC VEHICLE	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in electric vehicle technologies which helps the students attain better employment	
46	20EE3242	COMMUNICATION PROTOCOLS & AND TESTING OF EV	PE	3	0	0	0	3	NIL	New	Industry Experts	Employability	Covers the advanced Concepts in electric vehicle technologies which helps the students attain better employment
47	19EE3111	INDUSTRIAL AUTOMATION AND ROBOTICS	PE	3	0	0	0	3	NIL	Retained	Employability	Employability	Covers the advanced Concepts in industrial automation technologies which helps the students attain better employment
48	19EE3112	INTRODUCTION TO INDUSTRIAL INTERNET OF THINGS	PE	3	0	0	0	3	NIL	Retained	Employability	Employability	Covers the advanced Concepts in industrial automation technologies which helps the students attain better employment
49	19EE3111	INDUSTRIAL DRIVES AND CONTROL	PE	3	0	0	0	3	NIL	New	Industry Experts	Employability	Covers the advanced Concepts in industrial automation technologies which helps the students attain better employment
50	20EE3212	INDUSTRIAL COMMUNICATION PROTOCOLS AND CYBER SECURITY	PE	3	0	0	0	3	NIL	New	Industry Experts	Employability	Covers the advanced Concepts in industrial automation technologies which helps the students attain better employment
51	20EE3213	SMART SENSORS AND SMART NETWORKING	PE	3	0	0	0	3	NIL	New	Industry Experts	Employability	Covers the advanced Concepts in industrial automation technologies which helps the students attain better employment

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52	19EE3131	DISTRIBUTION SYSTEM PRACTICES	PE	3	0	0	0	3	19EE2102	Retained	Employability	Covers the advanced Concepts in Smart Grid technologies which helps the students attain better employment
53	19EE3132	DISTRIBUTED ENERGY RESOURCES AND SMART	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in Smart Grid technologies which helps the students attain better employment
54	19EE3133	ENERGY MANAGEMENT SYSTEMS AND SCADA	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in Smart Grid technologies which helps the students attain better employment
55	20EE3231	SMART GRID COMMUNICATION AND CYBERSECURITY	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in Smart Grid technologies which helps the students attain better employment
56	20EE3232	INTERNET OF THINGS AND SMART GRID ANALYTICS	PE	3	0	0	0	3	NIL	Retained	Employability	Covers the advanced Concepts in Smart Grid technologies which helps the students attain better employment
57	20EE3101	AI TECHNIQUES IN ELECTRICAL ENGINEERING	FC	3	1	0	0	4	19EE2203	Retained	Employability	Covers the advanced Concepts of AI applied to electrical engineering which helps students attain better employment
58	20EE3102	ELECTRIC DRIVES	FC	3	1	0	0	4	19EE2202	Retained	Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
59	20EE3103	RESTRUCTURED POWER SYSTEMS	FC	3	1	0	0	4	19EE2102	Retained	Employability	Covers the advanced topics required for various specialization subjects in electrical engineering

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60	20EE3104	GREEN ENERGY FUNDAMENTALS	FC	4	0	0	0	4	Nil	New	Academic Peers	Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
61	20EE3108	UTILISATION OF ELECTRICAL ENERGY	FC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
62	20EE3201	CUSTOM POWER DEVICES	FC	3	1	0	0	4	Nil	New	Academic Peers	Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
63	20EE3205	ELECTRIC VEHICLE TECHNOLOGY	FC	4	0	0	0	4	Nil	New	Academic Peers	Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
64	20EE3206	SENSORS AND THE INTERNET OF THINGS	FC	3	0	2	0	4	Nil	Retained		Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
65	20EE3207	SWITCHED MODE POWER SUPPLIES	FC	4	0	0	0	4	20EE2202	New	Academic Peers	Employability	Covers the advanced topics required for various specialization subjects in electrical engineering
66	20MB4051	Modelling Business Systems	ME	2	0	0	0	2	Nil	Retained		Entrepreneurship	Covers business modelling systems which enable entrepreneurial thinking among the students
67	20IE2050	Social Internship	PR	0	0	0	8	2	Nil	Retained		Skill Development	Covers the on-field study which enables students to be able to identify societal problems

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68	20IE3050	Tech Internship	PR	0	0	0	8	2	Nil	Retained	Skill Development	Covers the on-field study which enables students to produce technical problems solving for social problems
69	20IE3150	Mid-Grad Capstone Project - I	PR	0	0	0	8	2	Nil	New	Skill Development	Enables students to produce technical problems solving for societal problems
70	20IE3250	Mid-Grad Capstone Project - II	PR	0	0	0	8	2	Nil	New	Skill Development	Enables students to produce technical problems solving for societal problems
71	20IE4150	Capstone Project - I	PR	0	0	0	24	6	Nil	Retained	Skill Development	Enables students to produce technical problems solving for societal problems
72	20IE4250	Capstone Project - II	PR	0	0	0	24	6	Nil	Retained	Skill Development	Enables students to produce technical problems solving for societal problems
73	19IE4050	Practice School	PR	0	0	0	24	6	Nil	Retained	Employability	Enables students to produce technical problems solving for societal problems
74	19IE4051	Internship	PR	0	0	0	24	6	Nil	Retained	Employability	Enables students to produce technical problems solving for societal problems
75	UC0015	SOCIAL WORK	HSS	2	0	0	0	0	NIL	New	Contemporary Skill Development	Covers the contemporary knowledge required for human values
76	20TS3101	Technical Proficiency - 1 / Entrepreneurial Incubation	SDC	0	0	0	12	3	Nil	Retained	Skill Development	Covers the practical knowledge of tools required for technical problem-solving

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77	20TS3202	Technical Proficiency - 2 / Technopreneurship	SDC	0	0	0	12	3	Nil	New	Alumni	Skill Development	Covers the practical knowledge of tools required for technical problem-solving
78	20TS4103	Technical Proficiency - 3 / Entrepreneurial Skilling	SDC	0	0	0	12	0	Nil	Retained		Entrepreneurship	Covers the practical knowledge of tools required for technical problem-solving
79	20TS4204	Technical Proficiency - 4 / Entrepreneurial Skilling	SDC	0	0	0	12	0	Nil	Retained		Entrepreneurship	Covers the practical knowledge of tools required for technical problem-solving
80	OE-1	Open Elective-1	OE	3	0	0	0	3	Nil	Retained		Employability	Covers the contemporary interdisciplinary knowledge required for core domain students
81	OE-2	Open Elective-2	OE	3	0	0	0	3	Nil	Retained		Employability	Covers the contemporary interdisciplinary knowledge required for core domain students
82	OE-5	Foreign Language Elective(OE-5)	OE	2	0	0	0	2	Nil	Retained		Skill Development	Covers the foreign language requirement to be able to work or study abroad

Percentage of Courses focusing on Employability= $59/82=72\%$

Percentage of Courses focusing on Entrepreneurship= $10/82=12\%$

Percentage of Courses focusing on Skill Development = $13/82=16\%$

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Annexure-III

1. Syllabus of New Course for Y20 admitted students

Course Code	Course Name	Cat	New Syllabus	Topics Added/Removed/Replaced	Change in Outcome	Justification for the Modification	Revision Percentage
20EE2104	Mathematical Transforms for Signal Processing		<p>:Introduction: Classification of signals, Continuous time signals and its classifications, Standard continuous time signals, Classification of continuous time systems, Discrete time signals and its classifications, Concept of frequency in discrete time signals, Standard discrete time signals, Discrete time systems, Classification of discrete time systems, Nyquist rate, Sampling theorem, Aliasing, Convolution, Correlation. Fourier series: Introduction, Dirichlet Conditions, Determination of Fourier Coefficients, Wave symmetry, Exponential form of Fourier series. Fourier Transform: Introduction, Condition for existence of Fourier Integral, Fourier Transform of arbitrary signals, standard signals and signals involving Impulse and Signum functions, Properties of Fourier Transform, Power Spectral Density, Nyquist Theorem, System Analysis using Fourier Transform. Laplace Transform: Introduction, Review of Laplace transform, Inverse Laplace transform, Properties of Laplace transforms, relation between Laplace transform and Fourier transform. Laplace transforms of various signals. Z-Transform: Introduction, Concept of Z-transform of a discrete sequence, region of convergence (ROC) for Z-transforms, constraints on ROC for various classes of signals, Inverse z-transform, Properties of Z-transforms.</p>	---		As per the feedback of Academic Peers	100%
20EE3212	INDUSTRIAL COMMUNICATION PROTOCOLS AND CYBER SECURITY	PE	<p>Industry 4.0- Globalization: The Fourth Revolution, LEAN Production Systems, Sensing & actuation, Communication, Networking types.</p> <p>Cyber-Physical Systems and Next Generation Sensors: Collaborative Platform and Product Lifecycle Management.</p> <p>Basics of Industrial IoT: Industrial Processes Industrial Sensing & Actuation, Industrial IoT: Business Model and Reference Architecture, Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing, IIoT Networking.</p> <p>Industrial IoT Computing: Big Data Analytics and Software Defined Networks, Data Center Networks, Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT</p> <p>Industrial IoT Application Domains: Healthcare, Power Systems, Oil, chemical and pharmaceutical industries, Applications of UAVs in Industries, and Real case studies.</p>				


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20EE3211	INDUSTRIAL DRIVES AND CONTROL	<p>Introduction: Definition of industrial automation, Mechanization vs automation, advantages of automation, goals of automation, reasons for automation, social issues of automation, types of automation, current emphasis in automation, Controllers Employed in Automated Systems, Case Studies. Computer Based Industrial Control: Introduction & Automatic Process Control, Building Blocks of Automation Systems; LAN, Analog & Digital I/O Modules Distributed Control System: Functional Requirements, Configurations & some popular Distributed Control Systems. Industrial automation and Case studies. Fundamentals of Industrial Robots-Specifications and Characteristics, Criteria for selection. Dynamic properties of robots-stability, control resolution, spatial resolution, accuracy, repeatability, compliance, work cell control, Interlocks Robotic Control Systems-Robot Motions, Drives, Actuators, Robot controllers, Power transmission systems. Robotic End Effectors and Sensors-Transducers and sensors: sensors in robotics and their classification, vision sensors, touch (tactile) sensors, proximity and range sensors, force and torque sensing. End Effectors-Types, grippers, various process tools as end effectors, Robot-End effectors interface, Active and passive compliance, Gripper selection and design. Robot Programming: Level of robot programming, Language based programming, task level programming, Robot programming synthesis, Industrial Applications and Case Studies</p>				
20EE3213	SMART SENSORS AND SMART NETWORKING	<p>Basics of smart sensors and micromachining: Introduction, Mechanical-Electronic transitions in sensing, nature of sensors, overview of smart sensing and control systems, integration of micromachining and microelectronics, introduction to micromachining, bulk micromachining, wafer bonding, surface micromachining, other micromachining techniques for Sensor Design. Sensor Communication and MEMS: Wireless zone sensing, surface acoustical wave devices, intelligent transportation system, RF-ID, Micro optics, micro-grippers, micro-probes, micro- mirrors, FEDs, communications for smart sensors – sources and standards, automotive protocols, industrial networks, office and building automation, home automation, protocols in silicon, other aspects of network communications. Packaging, Testing and Reliability of Smart Sensors: Introduction, Semiconductor packaging applied to sensors, reliability implications, testing smart sensors. Unit Standards for Smart Sensors: Introduction, setting the standards for smart sensors and systems, IEEE 1451.1, IEEE 1451.2, IEEE P1451.3, IEEE 1451.4, extending the systems to network. Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, – energy harvesting wireless sensors, Power sources for WSN – Power generation – conversion</p>	--		Industry expert	100%


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20EE3205	ELECTRIC VEHICLE TECHNOLOGY	PE	<p>Introduction: Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Types of EVs, Hybrid Electric Drive-train, Tractive effort in normal driving</p> <p>Electric Drives: Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor</p> <p>Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles:- Battery-based energy storage and its analysis, Fuel Cell-based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system, Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle,</p> <p>Energy Management System: Energy Management Strategies, Automotive networking and communication, EV charging standards, V2G, G2V, V2B, V2H. Business: E-mobility business, electrification challenges, Business- E-mobility business, electrification challenges,</p> <p>Mobility and Connectors: Connected Mobility and Autonomous Mobility- case study Emobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs. Connectors- Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV Plug Standards in North America, CCS (Combined Charging System), CHAdeMO, Tesla, European EV Plug Standards</p>	100
20EE3104	Green Energy Fundamentals		<p>Solar Radiation: Extra-terrestrial solar radiation, terrestrial solar radiation, solar thermal conversion, flat plate and concentrated solar thermal collectors, solar ponds, solar heating/cooling technique, solar distillation, photovoltaic energy conversion, solar cells – 4 models.</p> <p>Wind Energy: Planetary and local winds, vertical axis and horizontal axis windmills, principles of wind power, maximum power, actual power, wind turbine operation, yaw control, pitch control and stall control mechanisms, derivation of power coefficient.</p> <p>Energy from Oceans: Ocean temperature differences, principles of OTEC plant operations, wave energy, devices for energy extraction, tides, simple single pool tidal system. Geothermal Energy: Origin and types.</p> <p>Energy from Biomass: Biofuels, classification, direct combustion for heat and electricity generator, anaerobic digestion for biogas, biogas digester, and power generation, Biomass energy conversion technologies, Biogas generation – classification of Biogas plants, Micro hydro electric systems - different types of turbines.</p>	100

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20EE3201	Custom Powered Devices	<p>FACTS Concepts: Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters, basic types of FACTS controllers, and benefits from FACTS controllers</p> <p>Voltage Source Converters: Single phase, three phase full wave bridge converters transformer connections for 12 pulse operation. Three-level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.</p> <p>Static Shunt Compensation: Objectives of shunt compensation, midpoint voltage regulation, voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable var generation, variable impedance type static var generators, switching converter type var generators and hybrid var generators.</p> <p>SVC and STATCOM: SVC: FC-TCR and TSC-TCR. STATCOM: The regulation and slope. Comparison between SVC and STATCOM</p> <p>Static Series Compensators: Objectives of Series compensation, concept of series capacitive compensation, GTO thyristor-controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor-controlled series capacitor (TCSC) control schemes for GSC TSSC and TCSC.</p>				
20EE3207	SWITCHED MODE POWER SYSTEMS	<p>Non-isolated DC-DC converters: Introduction to DC-DC power supplies-Analysis and design of Buck, Boost, Cuk and SEPIC converters in continuous and discontinuous conduction modes-verification of theoretical analysis of converters using simulation tools. Isolated DC-DC converters: Introduction to DC-DC power supplies with isolation- Analysis and design of Forward and fly-back, Push-Pull, Half-bridge and full-bridge converters in continuous and discontinuous conduction modes-verification of theoretical analysis of converters using simulation tools.</p> <p>Resonant converters: Introduction to soft switching techniques, analysis and design of load resonant converters-Series load resonant converter-parallel load resonant converter and hybrid resonant converter - Resonant switch converter- Zero current switching, Zero voltage switching and Zero voltage switching with clamped voltage, comparison of Resonant converter topologies. Modelling of Non isolated DC-DC converters:</p> <p>Introduction to small signal Analysis- small signal Analysis of Buck, Boost, Buck-Boost converters in continuous and discontinuous conduction modes using averaged switch models, stability analysis of converters using transfer functions (open loop) derived from small signal Analysis .Closed loop control of converters: Introduction to control of switch mode DC power supplies, voltage feedback, voltage feed-forward, current mode PWM control of DC-DC converters, power supply protection and electrical isolation in a feedback loop.</p>				

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1. Course-wise Syllabus revision of approved structure as mentioned in point 1

Course Code	Course Name	Course Category	Existing Syllabus	New Syllabus	Topics Added/Removed/Replaced	Change in Outcome	Justification for the Modification	Revision Percentage
20EE1201	Basic Electrical and Electronic Circuits	ES	CO1: Mesh and Nodal Analysis, Theorems: Introduction to network elements, Mesh and Node Analysis. Network Theorems:- Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer, star/delta transformation and source transformation. - Simple numerical problems.CO2: Fundamentals of AC, Resonance: RMS and average values and form factor of Sinusoidal waveform, steady state analysis of R, L and C (in series, parallel and series-parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, j-notation, complex and polar forms of representations, complex power. Series and parallel resonance, bandwidth, selectivity, Q factor.CO3: Basic active Circuits elements: P & N - type semiconductors, P-N junction, forward bias and reverse bias, V-I characteristics, ideal and practical diodes, approximate model, types of diodes and variants (Introductory level only), Types of transistors (PNP and NPN)CO4: Applications of active elements: Clippers, Clampers, Rectifiers - HWR, FWR with and without capacitive filters, Zener diode as a voltage regulator. Applications of Transistor: Transistor as an amplifier, switching transistors, power transistors (low, medium and large power), a key parameter from the datasheet.	CO1: Mesh and Nodal Analysis, Theorems: Introduction to network elements, Mesh and Node Analysis. Network Theorems:- Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer, star/delta transformation and source transformation. - Simple numerical problems.CO2: Fundamentals of AC, Resonance: RMS and average values and form factor of Sinusoidal waveform, steady state analysis of R, L and C (in series, parallel and series-parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, j-notation, complex and polar forms of representations, complex power. Series and parallel resonance, bandwidth, selectivity, Q factor, current locus diagrams.CO3: Basic active Circuits elements: P & N - type semiconductors, P-N junction, forward bias and reverse bias, V-I characteristics, ideal and practical diodes, approximate model, diode datasheet, types of diodes and variants (Introductory level only), Types of transistors (PNP and NPN)CO4: Applications of active elements: Clippers, Clampers, Rectifiers - HWR, FWR with and without capacitive filters. Power supply with ripple reduction and regulation, Zener diode as a voltage regulator. Applications of Transistor: Transistor as an amplifier, switching transistors, power transistors (low, medium and large power), a key parameter from the datasheet. Analog & Digital ICs: 7805, 7905, IC 741, IC 555, LM 339, LM723.	Added: current locus diagrams, power supply with ripple reduction and regulation, analogue and digital ICs	no	A lab component is included in the course as per the feedback from alumni (Point 3.1 of annexure-I)	20

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20SC1203	OBJECT-ORIENTED PROGRAMMING	ENGINEERINGSCIENCE	<p>Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. Exception Handling: Exception Handling fundamentals.</p>	<p>Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. Exception Handling: Exception Handling fundamentals.</p>	A lab component is included in the course as per the feedback from the faculty	yes	A lab component is included in the course as per the feedback from faculty	15
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18EE2101	Electrical Circuits	Core	<p>Transient response: R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C impulse, step, ramp and sinusoidal excitations, initial conditions, time domain and Laplace transform methods of solutions. Coupled Circuits: concept of mutual inductance, dot convention, coefficient of coupling, Magnetic Circuits, Analysis of series and parallel magnetic circuits. Filters: Low pass, High Pass, Band Pass, Band Elimination, Prototype filters design Low and High pass filter – M - derived filters of Low Pass and High Pass - Numerical Problems. Two port networks: one port and two port networks, two port network parameters: Z, Y, Transmission and Hybrid parameters and their relationships. Network functions, driving point and transfer functions – poles and Zeros. Network topology: definitions, graph, tree, primitive matrices, basic node incidence, basic cut-set and basic tie set matrices for planar networks, Loop and Nodal methods of analysis of networks, introduction to network matrices.</p>	<p>Network topology: definitions, graph, tree, primitive matrices, basic node incidence, basic cut-set and basic tie set matrices for planar networks, Loop and Nodal methods of analysis of networks, dual & duality. Transient response: R-L, R-C, R-L-C circuits (Series and parallel combinations) for DC impulse, step, ramp and sinusoidal excitations, initial conditions, time domain and Laplace transform methods of solutions. Two port networks: one port and two port networks, two port network parameters: Z, Y, Transmission and Hybrid parameters and their relationships, introduction to network matrices. Network functions, driving point and transfer functions – poles and Zeros. Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, , Coupled Circuits, Analysis of series and parallel magnetic circuits. Filters: Low pass, High Pass, Band Pass, Band Elimination, Prototype filters design Low and High pass filter – M - derived filters of Low Pass and High Pass - Numerical Problems.</p>	<p>Added:Tutorial component is added for the course</p> <p>Removed: Laboratory component is removed</p>	<p>Yes</p>	<p>A tutorial component is included in the course as per the feedback from alumni</p>	<p>15%</p>
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Annexure-IV

Course structure and Syllabus Revision for 2020-21 M.Tech-PS & M.Tech PED programs

1. Course structure for 2020-21 admitted M.Tech-PS program

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New	Changes	Focused on	Employability/	Justification
18EE5101	Power System Dynamics &	PC	3	1	0	0	4	Nil	Retained		Employability		Covers the advanced topics which enable employability in the core sector and further study
18EE5102	Advanced Power System Analysis	PC	3	1	2	0	5	Nil	Retained		Employability		Covers the advanced topics which enable employability in the core sector and further study
18EE5103	Deregulated Operation of	PC	3	1	0	0	4	Nil	Retained		Employability		Covers the advanced topics which enable employability in the core sector and further study
18EE5104	Modern Control Theory	PC	3	1	0	0	4	Nil	Retained		Employability		Covers the advanced topics which enable employability in the core sector and further study
18EE5205	Real-Time Control of Power	PC	3	1	2	0	5	Nil	Retained		Employability		Covers the advanced topics which enable employability in the core sector and further study
18EE5206	AI Techniques in Power Systems	PC	3	1	0	0	4	Nil	Retained		Employability		Covers the advanced topics which enable employability in the core sector and further study

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18EE5207	Smart Grids Technologies	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5208	Digital Protection of	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51A1	Reactive Power Compensation	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51A2	Distribution System Planning	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51A3	Power System Reliability	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51B1	Alternative Sources of	PE	3	0	0	0	3	Nil	Retained	Entrepreneurshi	Covers the advanced topics which enable employability in the core sector and further study
18EE51B2	Digital Signal Processors and	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51B3	Optimization Techniques	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable employability in the core sector and further study
18EE52C1	FACTS DEVICES	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study

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18EE52C2	Energy Conservation &	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE52C3	Adaptive Control Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
19EE52D1	Floating Solar and Off-Shore	PE	3	0	0	0	3	Nil	Retained	Entrepreneurshi	Covers the advanced topics which enable employability in the core sector and further study
18EE52D2	Power Quality	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
19EE52D3	Energy Management	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18IE5149	Seminar	Project	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable employability in the core sector and further study
18IE5250	Term Paper	Project	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable employability in the core sector and further study
18IE6050	Dissertation	Project	0	0	72	0	36	Nil	Retained	Skill Development	Covers the advanced topics which enable employability in the core sector and further study

Percentage of Courses focusing on Employability= 18/23=78%

Percentage of Courses focusing on Entrepreneurship= 2/23=9%

Percentage of Courses focusing on Skill Development = 3/23=13%

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2. Course structure for 2020-21 admitted M.Tech-PED program

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Req uisit e	New Course/Revised	Changes Proposed by	Focused on	Justification
18EE5109	Modeling and Analysis of Electrical Machines	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5110	Analysis of Power Converters	PC	3	1	2	0	5	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5111	Power Electronic Control Of Drives	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5104	Modern Control Theory	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5113	Advanced Power Converters	PC	3	1	2	0	5	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5114	Advanced Electrical Drives	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE5207	Smart Grids Technologies	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable employability in the core sector and further study

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18EE5116	FPGA Controllers and Applications	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51E1	Microcontrollers and Applications	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51E2	Digital Simulation of Power Electronic Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51E3	Industrial Control Electronics	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51F1	Soft Computing Techniques	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable employability in the core sector and further study
18EE51B2	Digital Signal Processors and Applications	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE51B3	Optimization Techniques	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable employability in the core sector and further study

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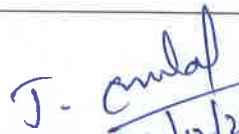
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18EE52C1	FACTS DEVICES	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE52H2	Electric and Hybrid Vehicles	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18EE52C3	Adaptive Control Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
19EE52D1	Floating Solar and offshore wind technologies	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable employability in the core sector and further study
18EE52D2	Power Quality	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
19EE52D3	Energy Management Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable employability in the core sector and further study
18IE5149	Seminar	PRINT	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable employability in the core sector and further study
18IE5250	Term Paper	PRINT	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable employability in the core sector and further study


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18IE6050	Dissertation	PRINT	0	0	72	0	36	Nil	Retained	Skill Development	Covers the advanced topics which enable employability in the core sector and further study
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Percentage of Courses focusing on Employability = $18/23=78\%$

Percentage of Courses focusing on Entrepreneurship = $2/23=9\%$

Percentage of Courses focusing on Skill Development = $3/23=13\%$

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Annexure-V**List of Certificate Courses to be offered by the Department of EEE for AY 2020-21**

SNO	Name of the Course	Regulation	Course Level	Offered to Specializations	Organizing Institute	Focused on
1	Industrial Automation with PLC	Y17	2	GET, SGT, EVT	APSSDC	Employability
2	Android Application Development	Y17	2	GET, SGT, EVT	APSSDC	Employability
3	IoT and Data science for Smart Grid	Y17	3	GET, SGT, EVT	ENTUPLE	Employability
4	BEV Technology-Power Train Sizing	Y18,Y19	1	EVENT	DECIB.ELS LAB Pvt. Ltd	Employability
5	IoT and Data science for Smart Grid	Y18, Y19	1	GET, SGT	ENTUPLE	Employability
6	Data Analysis and Machine Learning with Python	Y18	3	GET, SGT, EVT	APSSDC	Employability

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20EE2104: Mathematics for Signal Processing

L-T-P-S: 2-1-0-0

Credits: 3

Pre-requisite: NIL

Mapping of Course Outcomes with PO/PSO:

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	understand basic concepts related to Signals and Systems	PO1	2
CO2	Apply Fourier series and transforms to various periodic and aperiodic waveforms	PO1	3
CO3	Apply Laplace transforms and its properties to various signals	PO1	3
CO4	Apply Z transforms and its properties to various signals	PO1	3

Syllabus: Introduction: Classification of signals, Continuous time signals and its classifications, Standard continuous time signals, Classification of continuous time systems, Discrete time signals and its classifications, Concept of frequency in discrete time signals, Standard discrete time signals, Discrete time systems, Classification of discrete time systems, Nyquist rate, Sampling theorem, Aliasing, Convolution, Correlation. Fourier series: Introduction, Dirichlet Conditions, Determination of Fourier Coefficients, Wave symmetry, Exponential form of Fourier series. Fourier Transform: Introduction, Condition for existence of Fourier Integral, Fourier Transform of arbitrary signals, standard signals and signals involving Impulse and Signum functions, Properties of Fourier Transform, Power Spectral Density, Nyquist Theorem, System Analysis using Fourier Transform. Laplace Transform: Introduction, Review of Laplace transform, Inverse Laplace transform, Properties of Laplace transforms, relation between Laplace transform and Fourier transform. Laplace transforms of various signals. Z-Transform: Introduction, Concept of Z-transform of a discrete sequence, region of convergence (ROC) for Z-transforms, constraints on ROC for various classes of signals, Inverse z-transform, Properties of Z-transforms.

Text Books :

1. Proakis, J. G. (2001). Digital signal processing: principles algorithms and applications. Pearson Education India.
2. Oppenheim, A.V. & Willsky (1997). A.S., Signals and Systems. Prentice Hall of India 2 nd ed

Reference Books :

1. Haykin, S., & Van Veen, B. (2007). Signals and systems. John Wiley & Sons.

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Industrial Automation and Robotics

L-T-P-S: 3-0--0-0

Credits: 3

Pre-requisite: NIL

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the automation basics and components	1/2	2
CO2	Understand the automation process control	1/2	2
CO3	Understand the fundamentals of Industrial Robots	1/2	2
CO4	Understand the robotic end effectors and Sensors	1/2	2

Syllabus:

Introduction Definition of Automation- Mechanization vs Automation, Advantages of Automation, Goals of Automation, Social Issues of Automation, Types of Automation, Current Emphasis in Automation, Reasons for Automation, Issues for Automation in Factory Operations, Strategies for Automation, Controllers Employed In Automated Systems, Case Studies.

Computer Based Industrial Control: Introduction & Automatic Process Control, Building Blocks of Automation Systems: LAN, Analog & Digital I/O Modules Distributed Control System: Functional Requirements, Configurations & some popular Distributed Control Systems. Industrial automation and Case studies.

Fundamentals of Industrial Robots-Specifications and Characteristics, Criteria for selection. Dynamic properties of robots-stability, control resolution, spatial resolution, accuracy, repeatability, compliance, work cell control, Interlocks Robotic Control Systems-Robot Motions, Drives, Actuators, Robot controllers, Power transmission systems.

Robotic End Effectors and Sensors-Transducers and sensors: sensors in robotics and their classification, vision sensors, touch (tactile) sensors, proximity and range sensors, force and torque sensing. End Effectors-Types, grippers, various process tools as end effectors, Robot-End effectors interface, Active and passive compliance, Gripper selection and design.

Robot Programming: Level of robot programming, Language based programming, task level programming, Robot programming synthesis, Industrial Applications and Case Studies

Text Books:

1. "Automation, Production Systems & Computer Integrated Manufacturing", Mikell P. Groover, PHI Learning Pvt. Ltd. New Delhi, 3rd Edition 2012.
2. "Industrial Robotics, Technology, Programming & Applications", Groover
3. M.P., Weiss, M. Nagel, R.N. & Odrey, N.G. Ashish Dutta, Tata McGraw Hill Education Pvt. Ltd. New Delhi, 2nd Edition, 2012.
4. "Robot Technology Fundamentals", Keramas, James G., Thomson Learning- Delmar, 2nd Edition, 2002.

Reference Books:

1. An Introduction to Robot Technology (Vol. I-V) Phillipe Collet Prentice Hall Coiffet and Chirooza Kogan.
2. S.R. Deb, Robotics and Flexible Automation, Tata mc Graw Hill.
3. A.K Gupta, S.K. Arora, Industrial Automation and Robotics, Laxmi Publication (P) Ltd..

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Introduction to Industrial Internet of Things (IIOT)

L-T-P-S: 3-0-0-0

Credits: 3

Pre-requisite: NIL

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the Industry 4.0 Globalization	1/2	2
CO2	Understand the Model and architecture of IIOT	1/2	2
CO3	Understand the IIoT Computing	1/2	2
CO4	Understand the Various Applications of IIoT	1/2	2

Syllabus:

Industry 4.0- Globalization: The Fourth Revolution, LEAN Production Systems , Sensing & actuation, Communication, Networking types.

Cyber Physical Systems and Next Generation Sensors: Collaborative Platform and Product Lifecycle Management.

Basics of Industrial IoT: Industrial Processes Industrial Sensing & Actuation, Industrial IoT: Business Model and Reference Architecture, Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing, IIoT Networking.

Industrial IoT Computing: Big Data Analytics and Software Defined Networks, Data Center Networks, Industrial IoT: Security and Fog Computing - Fog Computing in IIoT, Security in IIoT


Industrial IoT Application Domains: Healthcare, Power Systems, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies.

Text Books;

1. Industry 4.0: The Industrial Internet of Things", by Alasdair Gilchrist (Apress), 2017.
2. "Industrial Internet of Things: Cybermanufacturing Systems" by Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer), 2017.

Reference Books:

1. Hands-On Industrial Internet of Things: Create a powerful Industrial IoT by Giacomo Veneri, Antonio Capasso, Packt, 2018.


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Industrial Drives and Control

L-T-P-S: 3-0-0-0

Credits: 3

Pre-requisite: NIL

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand Basics of Electric Drives and Dynamics	1/1	2
CO2	Understand Closed loop control of DC drives	1/1	2
CO3	Understand the Control schemes of BLDC motors	1/1	2
CO4	Understand the Programmable control of Drives	1/1	2

Syllabus:

Electrical drives: An introduction to electrical drives, parts of electrical drives, types of drives-ac/dc, choice of electrical drives,

Dynamics and control of electrical drives: industrial load types –continuous and batch processes, sensors- voltage, current, speed, choice and sizing of drive components, dynamics of drive system: starting, braking and speed control.

Closed loop control of DC drives: phase controlled and chopper controlled DC drives, controller design

Closed loop control of Induction motor drives: V/f control, direct torque control, controller design

BLDC motor control: Torque-speed characteristics, Controllers-Microprocessor based controller. Sensor less control.

Stepper motor control: Stepper Motors - Dynamic characteristics, Drive systems and circuit for open loop control, closed loop control of stepping motor.

Programmable Logic Controller (PLC) Basic PLC programming and Basic PLC functions: Programming on / off inputs to produce on / off outputs, PLC programming examples. Motor control schemes.

Text books

1. R Krishnan, "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education, 2001.
2. G. K. Dubey & C. R. Kasaravada, "Power Electronics & Drives", Tata McGraw Hill, 1993.

Reference books

1. G. K. Dubey, "Power Semiconductor controlled drives", Prentice Hall Inc., New Jersey (1989).
2. VedamSubrahmanyam, "Electrical Drives concepts and Applications", Tata McGraw Hill publishers (2008).
3. P. V. Rao, "Power semiconductor Drives", B. S. Publications (2007).
4. V. R. Moorthi, "Power Electronics Devices, Circuits and Industrial Applications", Oxford University Press (2010).

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Industrial Communication Protocols & Cyber Security

L-T-P-S: 3-0-0-0

Credits: 3

Pre-requisite: NIL

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the communication technology protocols & standards	1/2	2
CO2	Understand the information security and measurement technology	1/2	2
CO3	Understand the introduction to cyber crime	1/2	2
CO4	Understand the hacking and cyber-security models	6/2	2

Syllabus

Different types of Communication technologies for the smart grid, Modbus - Modbus Protocol Overview - PROFIBUS-FMS, DP, PA and technology overview - DNP3- IP based Real Time data Transmission, Substation communication network.

PROTOCOL & STANDARDS

Introduction to Industrial Network Technology CAN and CiA (CAN in Automation)- Technical Overview - Application Layers- CAN Kingdom- CAN open -Introduction-Benefits and Challenges Of Interoperability, Model For Smart Grid Network Interoperability, Approach to Smart Grid Interoperability Standards, IEC61850, GOOSE.

INFORMATION SECURITY AND MEASUREMENT TECHNOLOGY

Introduction – Encryption and Decryption Authentication, Digital signature, Message digest, cyber security standards. Communication and Measurement - Monitoring, GIS and Google Mapping Tools-

Introduction to Cyber Crime - Classification of Cyber Crimes- Reasons for Commission Of Cyber Crimes - Malware – Types -Cyber Security Initiatives in India -Counter Cyber Security initiatives in India -Wireless Security - Major Issues With WLAN - Secure WLAN- Wi-Fi at Home.//

HACKING AND CYBER-SECURITY MODELS

Identifying a target-Vulnerability- Attack tools-Attack methods-Cyber security architecture • SGCG reference architecture - ISA-62443: zones and conduits and Smart Grids - Smartphone Security- Smartphone Security Guidelines- Communicating Securely (Through Voice and Messages) with a Smartphone- Secure Voice Communication- Sending Messages Securely

Text books:

1. JanakaEkanayake, N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.
2. James Momoh "Smart grid: Fundamental of Design and analysis" ,John Wiley & sons Limited IEEE Press (2012).

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Smart Sensors and Sensor Networking

L-T-P-S: 3-0-0-0

Credits: 3

Pre-requisite: NIL

Mapping of Course Outcomes to Program outcomes:

CO#	Course Outcome	PO/PSO	BTL
CO1	Understand the basics of smart sensors and micromachining	2	2
CO2	Understand the sensor communication:	5	3
CO3	Understand the packaging, testing and reliability of smart sensors:	3	2
CO4	Understand the wireless sensor networks:	2	2

Syllabus:

Basics of smart sensors and micromachining: Introduction, Mechanical-Electronic transitions in sensing, nature of sensors, overview of smart sensing and control systems, integration of micromachining and microelectronics, introduction to micromachining, bulk micromachining, wafer bonding, surface micromachining, other micromachining techniques for Sensor Design.

Sensor Communication and MEMS: Wireless zone sensing, surface acoustical wave devices, intelligent transportation system, RF-ID, Micro optics, micro-grippers, micro-probes, micro-mirrors, FEDs, communications for smart sensors – sources and standards, automotive protocols, industrial networks, office and building automation, home automation, protocols in silicon, other aspects of network communications.

Packaging, Testing and Reliability of Smart Sensors: Introduction, Semiconductor packaging applied to sensors, reliability implications, testing smart sensors.

Unit Standards for Smart Sensors: Introduction, setting the standards for smart sensors and systems, IEEE 1451.1, IEEE 1451.2, IEEE P1451.3, IEEE 1451.4, extending the systems to network.

Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, – energy harvesting wireless sensors, Power sources for WSN – Power generation – conversion

Text Books:

1. Understanding Smart Sensors- Randy Frank, 2nd Edition. Artech House Publications, 2013.

Reference Books:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat, V. K. Aatre, Micro and Smart Systems: Technology and modeling, Willey Publications, 2012.

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Annexure-IV

Course structure and Syllabus Revision for 2020-21 M.Tech-PS & M.Tech PED programs

1. Course structure for 2020-21 admitted M.Tech-PS program

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Requisite	New	Changes	Focused on Employability/	Justification
18EE5101	Power System Dynamics &	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5102	Advanced Power System Analysis	PC	3	1	2	0	5	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5103	Deregulated Operation of	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5104	Modern Control Theory	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5205	Real Time Control of Power System	PC	3	1	2	0	5	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5206	AI Techniques in Power Systems	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study

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18EE5207	Smart Grids Technologies	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5208	Digital Protection of	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51A1	Reactive Power Compensation	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51A2	Distribution System Planning	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51A3	Power System Reliability	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51B1	Alternative Sources of	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable for employability in core sector and further study
18EE51B2	Digital Signal Processors and	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51B3	Optimization Techniques	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable for employability in core sector and further study
18EE52C1	FACTS DEVICES	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study

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18EE52C2	Energy Conservation & PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study	
18EE52C3	Adaptive Control Systems	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study	
19EE52D1	Floating Solar and Off Shore	3	0	0	0	3	Nil	Retained	Entrepreneurshi	Covers the advanced topics which enable for employability in core sector and further study	
18EE52D2	Power Quality	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study	
19EE52D3	Energy Management	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study	
18IE5149	Seminar	Project	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable for employability in core sector and further study
18IE5250	Term Paper	Project	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable for employability in core sector and further study
18IE6050	Dissertation	Project	0	0	72	0	36	Nil	Retained	Skill Development	Covers the advanced topics which enable for employability in core sector and further study

Percentage of Courses focusing on Employability= 18/23=78%

Percentage of Courses focusing on Entrepreneurship= 2/23=9%

Percentage of Courses focusing on Skill Development = 3/23=13%

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2. Course structure for 2020-21 admitted M.Tech-PED program

Course Code	Course Name	Course Category	L	T	P	S	CR	Pre-Req uisit e	New Course/ Revised	Changes Proposed by	Focused on	Justification
18EE5109	Modeling and Analysis of Electrical Machines	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5110	Analysis of Power Converters	PC	3	1	2	0	5	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5111	Power Electronic Control Of Drives	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5104	Modern Control Theory	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5113	Advanced Power Converters	PC	3	1	2	0	5	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5114	Advanced Electrical Drives	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE5207	Smart Grids Technologies	PC	3	1	0	0	4	Nil	Retained		Employability	Covers the advanced topics which enable for employability in core sector and further study

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18EE5116	FPGA controllers and Applications	PC	3	1	0	0	4	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51E1	Microcontrollers and Applications	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51E2	Digital Simulation of Power Electronic Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51E3	Industrial Control Electronics	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51F1	Soft Computing Techniques	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable for employability in core sector and further study
18EE51B2	Digital Signal Processors and Applications	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE51B3	Optimization Techniques	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable for employability in core sector and further study

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18EE52C1	FACTS DEVICES	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE52H2	Electric and Hybrid Vehicles	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18EE52C3	Adaptive Control Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
19EE52D1	Floating Solar and off shore wind technologies	PE	3	0	0	0	3	Nil	Retained	Entrepreneurship	Covers the advanced topics which enable for employability in core sector and further study
18EE52D2	Power Quality	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
19EE52D3	Energy Management Systems	PE	3	0	0	0	3	Nil	Retained	Employability	Covers the advanced topics which enable for employability in core sector and further study
18IE5149	Seminar	PRI	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable for employability in core sector and further study
18IE5250	Term Paper	PRI	0	0	4	0	2	Nil	Retained	Skill Development	Covers the advanced topics which enable for employability in core sector and further study

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18IE6050	Dissertation	PRI	0	0	72	0	36	Nil	Retained	Skill Development	Covers the advanced topics which enable for employability in core sector and further study
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Percentage of Courses focusing on Employability= 18/23=78%

Percentage of Courses focusing on Entrepreneurship= 2/23=9%

Percentage of Courses focusing on Skill Development = 3/23=13%

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Annexure-V

List of Certificate Courses to be offered by Department of EEE for AY 2020-21

SNO	Name of the Course	Regulation	Course Level	Offered to Specializations	Organizing Institute	Focused on
1	Industrial Automation with PLC	Y17	2	GET, SGT, EVT	APSSDC	Employability
2	Android Application Development	Y17	2	GET, SGT, EVT	APSSDC	Employability
3	IoT and Data science for Smart Grid	Y17	3	GET, SGT, EVT	ENTUPLE	Employability
4	BEV Technology-Power Train Sizing	Y18,Y19	1	EVT	DECIB.ELS LAB* Pvt. Ltd	Employability
5	IoT and Data science for Smart Grid	Y18, Y19	1	GET, SGT	ENTUPLE	Employability
6	Data Analysis and Machine Learning with Python	Y18	3	GET, SGT, EVT	APSSDC	Employability

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Annexure-IV

Syllabus of Revised Courses

20EE1201- Basics of Electrical and Electronics Engineering

Existing Syllabus

CO1: Mesh and Nodal Analysis, Theorems: Introduction to network elements, Mesh and Node Analysis. **Network Theorems:-** Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer, star/delta transformation and source transformation. - Simple numerical problems.

CO2: Fundamentals of AC, Resonance: RMS and average values and form factor of Sinusoidal wave form, steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, j-notation, complex and polar forms of representations, complex power. Series and parallel resonance, bandwidth, selectivity, Q factor.

CO3: Basic active Circuits elements: P & N - type semiconductors, P-N junction, forward bias and reverse bias, V-I characteristics, ideal and practical diodes, approximate model, types of diodes and variants (Introductory level only), Types of transistors (PNP and NPN)

CO4: Applications of active elements: Clippers, Clampers, Rectifiers - HWR, FWR with and without capacitive filters, Zener diode as a voltage regulator. **Applications of Transistor:** Transistor as an amplifier, switching transistors, power transistors (low, medium and large power), key parameter from data sheet.

New Syllabus

CO1: Mesh and Nodal Analysis, Theorems: Introduction to network elements, Mesh and Node Analysis. **Network Theorems:-** Superposition, Reciprocity, Thevenin's, Norton's, Maximum power transfer, star/delta transformation and source transformation. - Simple numerical problems.

CO2: Fundamentals of AC, Resonance: RMS and average values and form factor of Sinusoidal wave form, steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation, concept of reactance, impedance, susceptance and Admittance, Phase and Phase difference, concept of power factor, Real and Reactive powers, j-notation, complex and polar forms of representations, complex power. Series and parallel resonance, bandwidth, selectivity, Q factor, current locus diagrams.

CO3: Basic active Circuits elements: P & N - type semiconductors, P-N junction, forward bias and reverse bias, V-I characteristics, ideal and practical diodes, approximate model, diode data sheet, types of diodes and variants (Introductory level only), Types of transistors (PNP and NPN)

CO4: Applications of active elements: Clippers, Clampers, Rectifiers - HWR, FWR with and without capacitive filters. Power supply with ripple reduction and regulation, Zener diode as a voltage regulator. **Applications of Transistor:** Transistor as an amplifier, switching transistors, power transistors (low, medium and large power), key parameter from data sheet. **Analog & Digital ICs:** 7805, 7905, IC 741, IC 555, LM 339, LM723.

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20EE2101- Electrical Circuits

Existing Syllabus

CO1: Two port Networks: One port and two port networks, two port network parameters: Z, Y, Transmission and Hybrid parameters and their relationships.

CO2: Transients: Response of R-L, R-C, R-L-C (Series and parallel combinations) for impulse, step, ramp excitations. Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, initial conditions, time domain and Laplace transform methods of solutions.

CO3: Three Phase Circuits: Three phase circuits-phase sequence, star and delta connection, Relation between line and phase voltages and currents in balanced systems, Analysis of balanced and unbalanced 3 phase circuits. **Network Topology** - definitions, graph, tree, basic cut-set and basic tie set matrices for planar network, Loop and Nodal methods of analysis of networks

CO4: Magnetic circuits: concept of mutual inductance, dot convention, coefficient of coupling, Magnetic Circuits, Analysis of series and parallel magnetic circuits.

New Syllabus

CO1: Two port Networks: One port and two port networks, two port network parameters: Z, Y, Transmission and Hybrid parameters and their relationships.

CO2: Transients: Response of R-L, R-C, R-L-C (Series and parallel combinations) for impulse, step, ramp excitations. Transient response of R-L, R-C, R-L-C circuits (Series and parallel combinations) for D.C and sinusoidal excitations, initial conditions, time domain and Laplace transform methods of solutions.

CO3: Three Phase Circuits: Three phase circuits-phase sequence, star and delta connection, Relation between line and phase voltages and currents in balanced systems, Analysis of balanced and unbalanced 3 phase circuits. **Network Topology** - definitions, graph, tree, basic cut-set and basic tie set matrices for planar network, Loop and Nodal methods of analysis of networks, duality and dual networks.

CO4: Magnetic circuits: concept of mutual inductance, dot convention, coefficient of coupling, Magnetic Circuits, Analysis of series and parallel magnetic circuits.

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Switched Mode DC Power Supplies

Syllabus:

Non isolated dc-dc converters: Introduction to dc-dc power supplies-Analysis and design of Buck, Boost, Cuk and SEPIC converters in continuous and discontinuous conduction modes-verification of theoretical analysis of converters using simulation tools.

Isolated dc-dc converters: Introduction to dc-dc power supplies with isolation- Analysis and design of Forward and fly-back, Push-Pull, Half bridge and full-bridge converters in continuous and discontinuous conduction modes-verification of theoretical analysis of converters using simulation tools.

Resonant converters: Introduction to soft switching techniques, analysis and design of load resonant converters-Series load resonant converter-parallel load resonant converter and hybrid resonant converter - Resonant switch converter- Zero current switching, Zero voltage switching and Zero voltage switching with clamped voltage, comparison of Resonant converter topologies.

Modelling of Non isolated dc-dc converters:Introduction to small signal Analysis- small signal Analysis of Buck, Boost, Buck-Boost converters in continuous and discontinuous conduction modes using averaged switch models, stability analysis of converters using transfer functions (open loop) derived from small signal Analysis.

Closed loop control of converters: Introduction to control of switch mode dc power supplies, voltage feedback, voltage feed forward, current mode PWM control of DC-DC converters, power supply protection and electrical isolation in feedback loop.

Text books:

1. Power Electronics Converters, applications & devices- Mohan, Undeland Robbins, Wiley Publications, 2003.
2. Power Electronics by Daniel W.Hart, Tata McGraw-Hill publication.2011.

Reference Books:

1. Power – Switching Converters; Second Edition by Simon Ang & Alejandro Oliva, CRC Publications,2005
2. Fundamentals of Power Electronics-R.W.Erickson and D.Maksimovic-second edition –kluwer publishers,sixth printing-2004.
3. Power Electronics and applications by L. Umananand Wiley India publications.2009

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